Nature Rambles

by

Edward Step

10p

Winter to Spring

THE
COME-WITH-ME"
BOOKS

NATURE RAMBLES

1 Pl. 1. **Flowers of Early Spring** *Frontispiece*

1. Moschatel (p. 10); 2. Lesser Celandine (p. 5); 3. Colt's-foot (p. 20); 4. Cuckoo-pint (p. 28).

NATURE RAMBLES

AN INTRODUCTION TO COUNTRY-LORE

BY

EDWARD STEP, F.L.S.

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"WAYSIDE AND WOODLAND BLOSSOMS,"
"ANIMAL LIFE OF THE BRITISH ISLES,"
ETC., ETC.

WINTER TO SPRING

With Sixteen Plates in Colour, Fifteen Half-tone Plates and Sixty Text Illustrations

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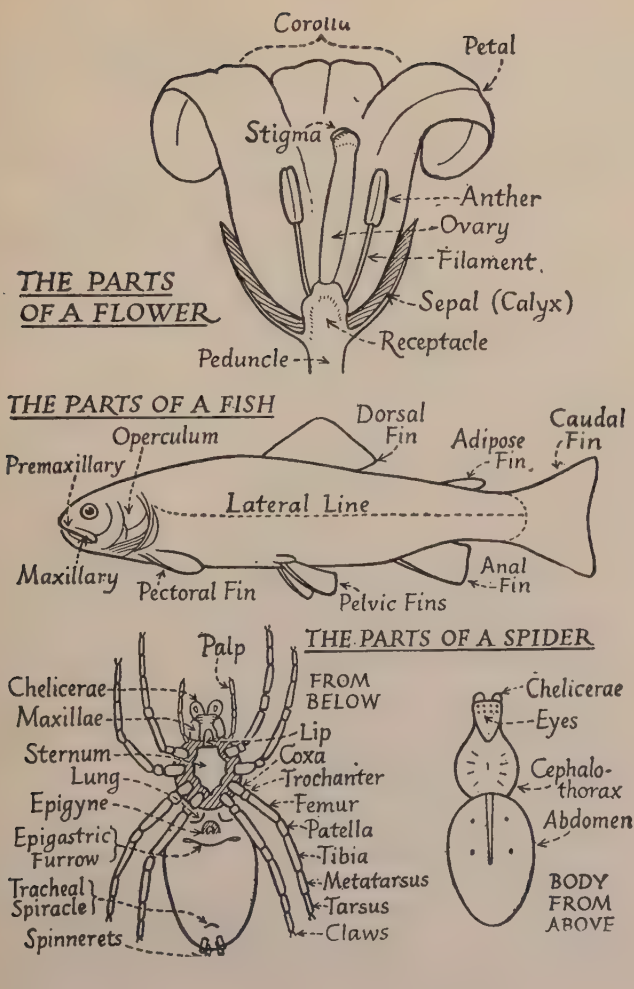
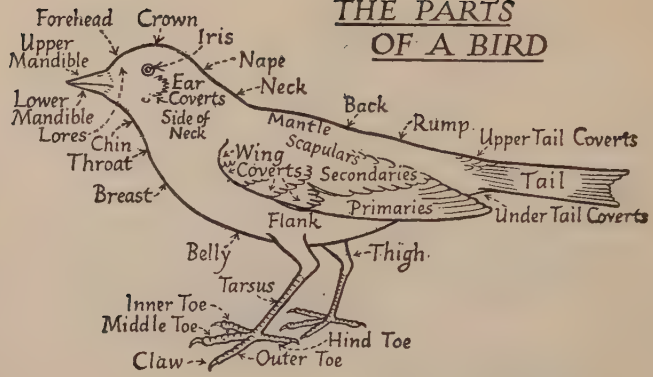
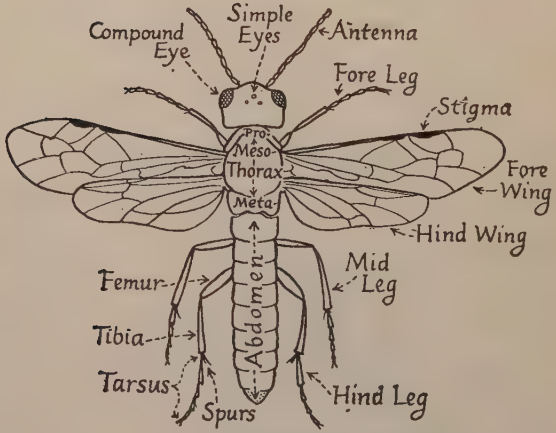

Corolla
Petal
Stigma
Anther
Ovary
Filament
Sepal (Calyx)
Receptacle
Peduncle
THE PARTS OF A FLOWER
THE PARTS OF A FISH
Operculum
Premaxillary
Dorsal Fin
Adipose Fin
Caudal Fin
Lateral Line
Maxillary
Pectoral Fin
Pelvic Fins
Anal Fin
THE PARTS OF A SPIDER
Palp
Chelicerae
Maxillae
Sternum
Lung
Epigyne
Epigastric Furrow
Tracheal Spiracle
Spinnerets
FROM BELOW
Lip
Coxa
Trochanter
Femur
Patella
Tibia
Metatarsus
Tarsus
Claws
Chelicerae
Eyes
Cephalo-thorax
Abdomen
BODY FROM ABOVE



THE PARTS OF A BIRD



THE PARTS OF A WINGED INSECT

I

THE COMING OF SPRING

How long the winter has been in going! Winters are always long; but some of them seem to us much longer than they ought to be, owing to a lengthy spell of north-east winds filling the sky with dark, heavy cloud, when we are longing to see the swaying tassels of the hazel, the golden stars of lesser celandine and the haloes of the leafless coltsfoot; to hear the welcome call of cuckoo and the rippling song of nightingale.

To town-folk the winter always appears much longer than it does to dwellers in the country; these, being on the spot, can take a fair ramble during the eight or nine hours of daylight, making up for the scarcity of flowers and insects by watching for those birds that are with us only during the winter. There are, also, the shrews and mice in the hedge-bottom, and their hunters the stoat and weasel, to take note of; as well as glimpses of squirrels and the occasional bat that has woke for a brief flight. There are

almost endless treasures to be found in the pond, as soon as the thick ice has melted and made them easy to see and reach; and there are some things, such as many of the mosses, that can be found in full beauty during the cooler, moister months only.

But the great charm of the spring, when it comes, is, to most of us, that the old favourite flowers for which we have been watching come back to us one or two at a time, enabling us to admire them fully and to make notes of their structure and habits. We know that most of these things have their special times and haunts; and the knowledge should induce us to make our projected ramble include the spots that are most likely to yield us what we most wish to see. In finding what we sought, we are almost sure to find in addition something that is new to us.

This is a pleasing way by which to add to our knowledge of Nature—that is to say, if we take trouble to find out all we can about our discovery, so that we may know it when we meet with it again. There are, however, many things at present unknown to us that we might find without difficulty if we knew in advance that they live in the sort of place we are about to visit. It is the purpose of this little book and its companion volumes to point out some of the common wild things that may be found in the kind of places the reader is likely to select for his happy rambles and Nature-scouting.

There is a library of larger books known as " The Wayside and Woodland Series," in which a great number of the wild things of this country—beasts, birds, reptiles, fishes and insects, as well as wild-flowers, trees and ferns—have had their life stories told at greater length, with many splendid pictures. It is hoped that when you have made full use of the present little book, you will extend your knowledge of Nature by studying the fuller accounts to be found in the larger volumes.

II

ALONG THE HEDGEROW

SPRING begins at a different date in almost every year. If you look it up in the almanac you will find that the season so named begins on March 21st and ends on June 22nd; but that is an arrangement by astronomers of which Nature and naturalists take little notice. As soon as we get into the New Year we are on the look-out for the first sign that Spring is on the way. The first two months may be very wintry—and that is only what we should expect—but even if the ground has a thick covering of snow or is bound in ice, it is worth while going on a ramble, warmly clothed and well-shod.

If there should be a smooth layer of snow covering everything, there is little chance of finding anything fresh in the way of plants, except the tall dead stems of last year's Cow-parsnip and Hemlock; but even these are worth pulling apart, for beetles, earwigs and other small insects often adopt them as winter lodgings. But on the snow itself we shall find sharp

Song Thrush on nest (p. 10)

1 Pl. 3. **The Hedgerow in Early Spring (p. 6).** A 5.

prints of the feet of birds, and less clear impressions made by Weasel, Stoat, Rabbit or Mouse; and we must try to find out which was the maker of each. This is easy in the case of the usual hedgerow birds, for we can see them making the prints. But those of the mammals are made mostly at night, and we must guess from their form who made them. It is a good plan to sketch all these prints in our note-book and to keep them for reference. Sometimes, by following up these prints, we can track the animal either to its resting-place or to its feeding-ground.

FOOTPRINTS ON THE FRESH SNOW.

If, instead of snow, we have had a spell of mild weather, we shall find that quite a number of plants are becoming active, spreading new leaves and even opening a few flowers. Common weeds like Chickweed and Shepherd's Purse have a way of flowering all through mild winters, though the flowers may not open fully. Lesser Celandine (Plate 1), however, we have met with under the shelter of the hedge, with several golden flowers

open wide on the first day of the year. In such a season, too, we may find the catkins of the Hazel grown long and loose, and shaking out their pollen in the first week—a month or more in advance of the usual time.

SHEPHERD'S PURSE

As a rule the hedge itself is composed mainly of Hawthorn, because its many branches and twigs, ending in long spines, by much crossing make a thick, strong fence that cannot be broken through by man or cattle. But for similar reasons it is greatly valued by some of the small birds for a safe nesting place, well screened when the leaves are out; and in holes among its tough old roots mice make their runs, which find tenants later in Wasps and Humble-bees. The foliage, when it comes, supports or shelters varied forms of insect life.

Often, a long stretch of hedge is made more attractive by trees at intervals, some planted for strength when the hedge was first set up; others that have come of their own accord from seeds dropped by bird or beast, or blown in by strong winds (Plate 3). The big Oaks, Elms and Hollies were planted almost

certainly ; the Wild Cherry, the Field Maple, Spindle and Dogwood are more probably Nature's effort to give the hedge greater beauty. Smaller shrubs such as Dog Rose and Bramble, that like the support of more woody subjects, get here by like methods, and add to the value of the hedge by their hooks and prickles, whilst making it more attractive to us. Soft-stemmed climbers, like the two Bryonies, find it a most useful support, and they live through the winter as large, fleshy rootstocks in the ground at the hedge-foot.

COCOON OF HAWTHORN SAWFLY.

On some Hawthorn hedges, whilst they are still bare, we may find the cocoons of the Hawthorn Sawfly, one of the most striking of this group of insects : they have been there all the winter. They are nearly an inch long, of a pale brownish colour, and are cemented by one side to a branch. They were woven of silk and varnished by the Sawfly caterpillar, when it had finished feeding and was about to turn into a chrysalis. We will take a few of these and, keeping them under glass, we shall be able, in May, to see the perfect Sawfly emerge. When the time comes for the Sawfly to come out, it will give us notice by making a rasping noise that may continue for a whole

day. This is due to the fact that, after getting free from its chrysalis wrappings, it has got to cut through the tough cocoon: it is the action of its jaws in this task that we hear so plainly. Instead of just softening the cocoon and pushing through, as some moths do, our Sawfly sets to in workmanlike fashion. Making a cut near one end, it continues this in a straight line nearly all round leaving only enough to serve as a hinge.

LEAF OF ELDER.

After a short rest it spreads its wings (all Sawflies have four), and we see that it measures about an inch and a quarter across, the broad body blackish-brown, and the fore-wings with a front edge of black and dark clouded tips. The feelers have knobbed tips. You know that the Sawflies (of which there are many kinds) are so-called because at the tail-end of the body the females have a set of tiny saws with which they cut grooves in twigs, in which their eggs are laid.

A related Sawfly, very like it, but with brown body, may be found upon the Birch. Some of the Sawflies are great pests in gardens.

One of the surest signs that spring is close at hand, comes to us when we look along the lane and see that the long Hawthorn hedge is tinged faintly with bright green, which is due to the leaf-buds beginning to open. Then, perhaps, we come upon an Elder tree which is actually spreading its leaves. It can do this quickly because its leaf-buds are not wrapped up tightly like those of other trees.

RED DEAD-NETTLE.

From now on, we shall be finding many plants along the hedge-foot. One of the first of these to flower will be the pretty Red Dead-nettle, which only sprang from seed last autumn, but has already made a large patch with its brownish green, heart-shaped, wrinkled leaves, from which peep out the red-purple tubular flowers. Like Chickweed and Daisy, it keeps up its flower display nearly all through the year, greeting us from hedge-banks, field borders and all kinds of waste ground.

In some districts where the hedgerow is rather damp we may find thus early a little plant that few persons notice, though it may be there in plenty.

This is known as the Moschatel (Plate 1). It comes up year by year from the same fleshy, creeping root, but it is soon gone again. Most of the brittle leaves spring direct from the root on long stalks, and have three divisions, each cut again into three leaflets. The flowering stem has only two small leaves, cut into three, and at the top there is a strange cluster of five greenish flowers, all without stalks, and the fifth one lying close on the other four. In May or June we may find that these five flowers have combined to form a single green berry.

Even so early as March, it is by no means too soon to be on the look out for birds' nests in the hedge, though these will probably be of a few kinds only. Song-thrush, Blackbird, Hedge-sparrow and Red-breast are those most likely to have been building so early, though at times we may find that the Long-tailed Tit has joined them. Thrush and Blackbird are much alike in their manner of weaving their large cup-shaped egg-baskets, but you can always tell which is which by looking at or feeling gently the inner wall. Blackbird lines hers with moss and skeleton-leaves; Thrush secures comfort by a neat layer of plaster, wind-proof and water-tight (Plate 2). And then there are the eggs, which differ strongly in colour and markings: those of the Blackbird sprinkled closely with red-brown specks on a blue-grey ground; those of the Thrush shorter, of a

wonderful clear blue with a few black spots, mostly near the thicker end. The very early nest is most likely to prove to be that of the Thrush.

The nest of the Hedge-sparrow (Plate 4)—whose bright little song we may have been hearing for some distance along the hedge, for he is one of the early singers—is finely woven of roots, moss, grass and hair, with no stinting of the stuff. It is important to take note of the way in which a nest is finished off inside, for the safety of the eggs and the comfort of the chicks. The Hedge-sparrow lines hers with hair or fur. Most times you will find it is built quite low in the hedge; but, in spite of its name, it sometimes selects a bush that is far from any hedgerow. The five or six eggs are always of a brilliant greenish-blue, without markings of any sort.

ROBIN.

More than once in our prying along the hedgerow we must have seen Robin Redbreast watching us curiously and without any signs of fear, even treating us to snatches of his simple song. We can never be quite sure whether the Robin that is keenly following our movements is the cock or the hen bird, for they are coloured alike, and both have a little song.

Although the Robin is a hedgerow bird, it does not build its nest on the branches or twigs. If it is to be had, it prefers the shelter of some old kettle or tin-can that has been thrown away ; but if there is nothing of the kind about, a slight hollow in the bank will serve to hold the loosely woven basket of roots, moss and dead leaves, with a lining of hair, in which are laid the five or six pretty eggs. These are of a cream or very pale buff tint for the ground colour, on which are small spots of a deeper, redder tint.

Hosts of small plants are pushing their way through the rotting leaves at the hedge-foot, and many of these during the next month or two will be in full flower and filling the lane with beauty. Some of them are beautiful already, although they may be showing no signs of the flowers that are to be. Look at this fine rosette of the Welted Thistle, one of the commonest of wayside weeds. Being what is called a biennial plant, it came up from seed last year, and will not flower until June. But in its first year it has been making large and larger leaves whose edges run out into lobes which end in needle-like spines, a protection against too close attention from browsing beasts. In winter, when there has been a white frost, is the time at which to admire this Thistle's rosette. Then you shall see every one of its thousands of spines tipped with a sparkling ice-crystal. But we shall have

1 Pl. 4. **Hedge-Sparrow's nest (p. 11)** A 12.

1

2

3

4

5

1. Cinnabar Moth (p. 125); 2. Holly Blue Butterfly (p. 23); 3. Orange Underwing Moth (p. 103); 4. Small Tortoiseshell Butterfly (p. 25); 5. Pearl-bordered Fritillary (p. 73).

to talk about Thistles when the time comes for their flowering.

Just now, a striking feature at the hedge-foot are the thin, kidney-shaped leaves of Hedge-garlic or Jack-by-the-Hedge. These plants sprang from seeds in the autumn and have been making full use of the winter sunlight to make and store up the stuff needed for the building up of tall stems with leaves and flowers complete. Already, a few plants, more advanced than their fellows, have sent up short stems ; and here, you see, the different position of the stem-leaves has led them to alter their shape. These are all heart-shaped with scalloped and toothed edges. In the close cluster of baby leaves at the top of the stem there are the beginnings of flower-buds. Pick one of the finely veined leaves, and crush it between finger and thumb, when you will have a strong odour of garlic. In some parts of the country, the plant is known as Hedge-garlic for this reason. In May, all these plants will be two or three feet high, all the stems ending in small bunches of white flowers which are only a quarter of an inch across, and consist of four sepals, four petals placed crosswise, and six stamens. We shall meet with it again.

You have been looking at those silvery-grey clusters hanging down from some of the older branches of the hedge ; perhaps wondering what they are, though I think you know they are Lichens of some

sort. This is a very common kind, the Ragged Hoary Lichen, so called because its fronds appear torn into slender branches which divide again into threads and are white (hoary) on the lower surface. This and some others occur on the bark of old fruit trees in orchards; and some owners scrape them off in the belief that the Lichens are parasites, which suck the sap of the tree. But the chief harm they do is by acting as hiding places for insects which attack the leaves. Lichens can take nothing from the tree, because they have no roots and they get their living from the air entirely.

RAGGED HOARY LICHEN.

Here, on the ground, is a broad patch of another kind—the Dog-lichen, which got its name in ancient days when it was thought to be a cure for the bite of a mad

DOG LICHEN.

dog. This has a much broader frond which is not cut into threads, only into rounded lobes whose toothed edges curl up in dry weather, as at present. It is veined strongly on the under side, which is rather woolly. In damp weather it has a very different look, for the upper side is then apple-green. Take up a patch and carry it home: it will dry quickly for your collection. If you then break off a portion and wet it, you will in a few minutes see it assume the moist weather colour; also, you will see, as the frond gets flat, certain kidney-shaped lobes of the margin turn down and show their red-brown upper sides. These are the fruits of the lichen.

It is a matter for surprise and wonder that so few of us take any interest in Lichens, of which many hundreds of distinct kinds are to be found in this country. To find and know them all, we should have to devote most of our time to searching for them; but we can, at least, learn to know the forms that are to be met with in some of our rambles. But to find them at all, we must get well away from any big town, for the Lichens cannot live where there is much smoke from coal-fires in the air. One reason for taking an interest in Lichens is to be found in the strange story of their structure: for the Lichen is not a distinct plant like a daisy, a tree or a fern: it is always a partnership of two plants of quite opposite natures. One of the partners is a fungus which weaves the

upper and the lower parts of the Lichen-body, and the middle layers consist of numbers of minute one-celled green-plants.

In your walks you must have seen many posts and fences of unpainted wood, which after heavy rain have bright green patches upon them. If you were to scrape off a little of this colour whilst it is still moist, and look at it through the microscope, you would find that it consists of thousands of minute green cells, each of which is a complete plant. You may find the same simple plant in any little pool of stagnant water, as well as upon damp walls or soil; but though you can see it plainly when many thousands are crowded together, a single plant is so minute that our eyes cannot see it unless they have the aid of a microscope. With that help, we find that the plants are much the same size, and that they increase in numbers rapidly by a cell dividing into two parts and each of these again into two. They take in carbon-gas from the air, and in the water there are certain salts dissolved: all these things the green matter of the cell, with the aid of sunlight, can convert into starch or sugar.

Now, the fungus, surrounded by the same materials, cannot turn them into food of any sort, and has to feed upon what has been made by a green plant. All the fungi are alike in this matter: so they have to attack other plants as parasites or live upon dead leaves

and decaying animal remains. You have got to know all this before you can understand why the fungus and the green plant formed the Lichen partnership.

The fungus collects water with its contained salts from the ground, the bark or the moist air, and hands it over to its partner, and the green plant in return gives the fungus the kind of food that it requires. By this system of mutual aid, the partnership (symbiosis) is kept up through a long series of years—in some cases, probably, as long as the life of a tree. These long-lived Lichens, of course, will be those that grow on rocks and old walls where there is no risk of the support being disturbed; others, like the pretty Cup-mosses that grow on stumps and banks are liable to be cleared away whilst only a few years old.

FLOWERS OF SPURGE-LAUREL.

No: that little group of tall shrubs just in front of the hedge are not Rhododendrons, though from a short distance their large evergreen leaves give them a resemblance. Turn up the leaves, and you will see the flowers, which will convince you at once that this is not what you supposed. This is the Spurge-laurel,

a plant we are more likely to find about the beech woods on the chalk : for it is one of a great number of plants that show a special fondness for chalk, some so fond that you will never find them away from it. Spurge-laurel is not quite so insistent, and at times will put up with a stiff soil away from chalk, as here.

Spurge-laurel—which is neither a Spurge nor a Laurel—has a slender stem with only a few erect branches. It may grow to a height of four or five feet, but then has a rather spindly look, for the worn-out leaves that fell from the older parts are never replaced by new growth : the younger leaves form a spreading cluster at the top of the main stem and of each branch. These are thick and leathery, lance-shaped and four or five inches long, almost stalkless and with smooth, toothless edges. The flowers, which may be found any time in the New Year up to April, are yellow-green tubes with four lobes turned out at the mouth, and containing eight stamens and a pistil. They come out in clusters of four or five from what is called the axil of the leaf, that is the angle between the leaf-stalk and the stem. In this position they are almost hidden by a younger leaf above them. The tubes contain much nectar, so the plant is of great value to the bees that waken early in the year. The flowers are followed by oval berries, which turn black when ripe and are then eaten by birds, though to human beings they are

very poisonous. In some districts it is called Fox Poison.

About the third week in March, we shall find at the roots of the old Elms in the hedge one of the most strange plants that can be found anywhere. It is known as Toothwort, though, really, very few persons appear to know it at all. Its strangeness is in the fact that it has no leaves, is only a short, thick stem crowded with flowers, and that it lives hidden underground during the greater part of the year, making an appearance in public only for the purpose of flowering; then disappearing again. It is not alone among our wild plants in this respect: there are two or three others we may meet with in other places, later on.

TOOTHWORT.

When the Toothwort breaks through the earth, its stems are curved strongly, but they soon become very straight, and the flowers turn all towards us, though they are attached to the stem in three or four rows. The bract below each flower is a broad, thin scale, and below there are more fleshy scales which represent the leaves. You will notice that there is no tinge of green on any part of the plant, which is

proof that it does not work for its living but gets it at the expense of the tree to which it is attached underground. The general colouring is creamy-white, tinged with purple on the stem; and when the two-lipped corolla pushes out through the woolly calyx, it is purplish too. If you dig round the plant, you will find that it has no roots but is fixed by suckers to the roots of the tree: it is a root-parasite.

Another early plant we shall find along the hedge-bank is the Coltsfoot (Plate 1): that is to say, we shall first find its flowers, the leaves not coming up until later. The plant spends the winter underground as a thick, creeping rootstock, and when the coldest of the weather has gone it sends up several hollow, cottony stems, clad with large scales and ending in a large flower-head with slender bright yellow rays. This flower-head, like that of the Daisy and a host of other plants, is made up of a great number of tiny flowers (florets) packed closely on a platform (receptacle) so that they become more showy. Later, when they become seed-heads, they are balls of delicate white hairs, like the "clock" of Dandelion, but much smaller. These fine hairs (pappus) are really the calyx of the floret, at the top of the seed which they help, parachute-like, to carry through the air. When the flowers are over, small rolled up leaves appear, and expand into a broad heart-shape until they are nearly a foot across. There are wisps of cobwebby stuff on

1 Pl. 6. **Common Shrew and Wood-sorrel (p. 27)** B 20.

the dark green upper side, but below they are white with a cottony felt.

Soon after the Coltsfoot has flowered, we may expect to see the bright blue-purple blossoms of the Ground-ivy, so named not because it is related to the real Ivy or has any likeness to it, but because it creeps on the ground as young plants of Ivy creep. Some of these stems are more than a foot long, with small leaves in pairs, long-stalked, kidney-shaped, with the edges cut into rounded teeth. From these trailing stems, more erect branches are given off to bear the pretty tubular flowers, in clusters from the base of the leaf stalks. The flower has a tubular calyx with five teeth, and the long tube of the corolla expands into two lips: a small upper one protecting the stamens and pistil and a broad lower lip for insects to alight upon. Although the flowers are small,

GROUND-IVY.

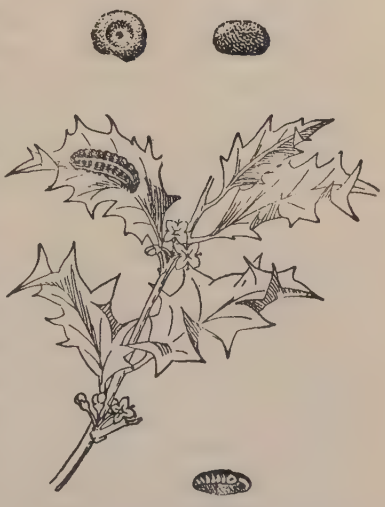
there are so many of them that they brighten large patches of hedgebank.

About this time we may expect to see another hedgerow beauty in the form of the Greater Stitchwort, whose large white flowers are in strong contrast with those of its near relation, the little Chickweed. The two plants are not at all alike, but if we compare the flowers we shall find that their structure agrees in all important points. The slender, brittle stems of Stitchwort may be two feet long, and instead of lying largely along the ground as do those of Chickweed, they find a hedge to lean against, or climb up between other plants by means of their long stiff leaves. These, in pairs, stand out at a right angle with the stem, and so lodge upon the branches of other plants that they keep their own plant steady and enable it to grow taller.

GREATER STITCHWORT.

The pretty lilac-blue butterfly, of which we have seen several flying by, is the earliest of the "Blues" to be on the wing. Now that we have reached one of the Holly-trees that support the hedge, we see two or three females flitting around, seeking the flower-

buds that are clustered thickly around the twigs. We know these Holly Blues (Plate 5) are females by the broad blackish border of the first pair of wings. But, you ask, what is the good of their haunting flower-buds that cannot be large enough to open for several weeks: there is no nectar to be sucked up. True; but these Blues are intent upon business more important than refreshment. They are laying eggs: a single egg on each cluster of buds. The egg hatches before the buds have had time to open and the tiny caterpillar that came from it, at once bites a hole in the calyx and feeds on the inner parts. Bud after bud is served in this way, until the caterpillar is full-fed and turns to a chrysalis. It will emerge as one of a second brood of Holly Blues in July or August; and the females of tha·



HOLLY BLUE BUTTERFLY. EGGS (ENLARGED), TOP AND SIDE VIEWS; CATERPILLAR AND CHRYSALIS.

brood will lay their eggs on the buds of Ivy, and so give rise to the butterflies of spring.

Another early example of animal life we are almost sure to meet with on the hedgebank is the Slow-worm (Plate 7). It is about from early spring until it retires to its winter quarters; but when there is more and taller herbage, we are less likely to see it. Just now it likes to lie in the sunshine, looking like a short length of Wild Cherry branch. When speaking of the Slow-worm (or Blind-worm, as it is also called) it is always thought proper to point out that it is not a worm, and neither slow in its movements nor blind. The position given to it by the naturalists who have studied its structure is among the lizards; and if anyone objects that to be a lizard it ought to have legs, the naturalist explains that under the coat of close-fitting, highly polished scales, embedded in the flesh, are certain bones which show that the remote ancestors of the Slow-worm had legs. To those who think the Slow-worm should be classed among snakes, it should be enough to point out that, besides great differences in the skeletons, the Slow-worm has movable eyelids and that the two halves of its lower jaw are united; the snake can never close its eyes. If you were to catch a Slow-worm by taking hold of its tail, this would snap off and the other part would glide away. Our other lizards escape in the same manner, but a snake does not part with its tail. Slow-

worms feed upon insects, spiders, worms; but are specially fond of slugs.

Slow-worms are born in a batch of six or more, late in summer, and are then little silvery things about two inches long, with a thin black line down the back. They have time to get well-fed before retiring, like their elders, to some snug burrow for the winter sleep.

If we have a few intervals of sunshine during our walk, we are sure to see two or three Brimstone Butterflies on the wing, and probably a Small Tortoiseshell (Plate 5), also: both breaking their long sleep for a short flight to see if spring has come. Soon, the Brimstone will be seeking for Buckthorn leaves on which to lay her eggs, and the Tortoiseshell will be interested in the Stinging Nettle. In May, when the hedgerow is white with the flowers of Jack-by-the-Hedge and Beaked Parsley, a frequent visitor to the blossoms will be the dainty Orange-tip Butterfly. It is only the male, really, that is entitled to the name, for the female is without the patch of orange that makes her mate so showy. His object is merely to obtain refreshment in the form of nectar. Both sexes, when they alight and fold the wings over the back, are more nearly alike: for both have the underside of the hind wings mottled with green and white. This type of colouring has a wonderful effect, for unless you see the insect alight you pass it as being part of the flower-cluster.

When we see the female of the Orange-tip settle upon the newly formed seed-pods of Jack-by-the-Hedge or Lady's-smock—where her colour is not very helpful in hiding her—we know that she is not seeking nectar but laying her tall eggs with great care, one egg on each plant, so that the caterpillars shall not be overcrowded. At first the egg is white, but soon becomes orange. Later we may meet with the caterpillar, and watch a little trick it has in feeding.

CUCKOO.

The well-known call of the Cuckoo has been coming to us from all sides during our walk, though only once or twice have we seen the caller; and now comes the clear, sharp "dear, dear, dear," of the Wryneck or Cuckoo's mate, as it is called from its arrival about the same time. Neither bird is found in this

WRYNECK.

country during the winter; both leave us at the end of summer for countries where they will find more insect food than they could get here. We shall be meeting with both before they go.

Towards evening, we are sure to see a pretty mouse-like beast moving about among the dead leaves at the hedge-foot, searching for insects with his long, pointed muzzle. This is no mouse, but the Common Shrew (Plate 6). We may meet with him in more open country, but he spends the colder months in the shelter of the hedge and in vacant mouse-runs below; not sleeping to pass the long winter as some of the small four-footed creatures do, for he requires pretty frequent food though this is of rather a light kind. Though more leisured in his movements than is the mouse, we might easily mistake his soft fur-clad body for one if we fail to see his long nose. Sometimes, he may be seen climbing the hedge in his search for insects; but when the grass grows long he moves out into the fields, where he can have runs somewhat under shelter—though this does not serve to hide him from some of the larger birds and the gliding Adder, who kill and eat the poor little Shrew in spite of the musky flavour which prevents killing dogs and cats from eating him.

We have been passing frequent small clumps of large spear-shaped leaves below the hedge. For some time there has been nothing but these leaves standing

about a foot above the ground, but now some tightly coiled little spindles have appeared. This is known as Cuckoo-pint or as Lords and Ladies (Plate 1). One of the spindles has unrolled and expanded into a great yellow-green hood of pale tint, and in the middle is a purplish "poker." If we tear open the hood, we shall find that in the swollen lower part of the hood, there are bands of simple flowers around the "poker." These flowers have neither sepals nor petals, and one band consists only of stamens, the other of pistils: stamens above, pistils below. Above the stamens there is a band of hairs, which bars the way down.

As you say, these details differ from those we are used to in most flowers; but there is a little story which explains the difference—a true story, which you can prove by opening several hoods. When the hood unrolls, there comes from it a warm, unpleasant smell such as you may have noticed when near the farmer's manure-heap. In that same place you may have seen large numbers of a tiny fly whose wings are covered so thickly with hairs that it gets mistaken at times for a minute moth. In the grub state it lives in the manure-heap; but the fly wanders about a good deal (you may see it climbing the window panes), and when it smells the well-known odour coming from the Cuckoo-pint it flies into the hood. As the barrier of hairs slopes downwards, the flies can push past it and reach the part where the flowers are.

1 Pl. 8. **Woodland Pond in Spring** (p. 33) C 28.

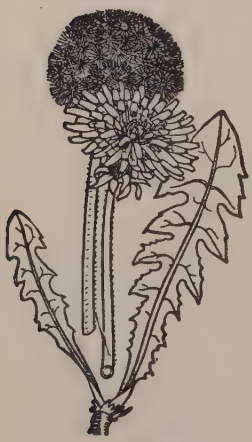
1 Pl. 9. **Common Frog (p. 34)** C. 2b.

Some of these visitors have been in a Cuckoo-pint already ; in that case they come with their hairy wings dusted with pollen.

Now, if you open the lower part of a hood in which the anthers are not yet ripe enough to set free their pollen, and you see some pollen-grains on the floor, you will know that it must have been shaken off the wings of one of these flies. The pistils are ripe already, and the restless flies, crawling over everything, dust them with pollen from their wings. Then, each pistil pours out a little nectar, which is sucked up by the flies. So far, the flies have been unable to get out for the fence of hairs resisted pressure from below. Now that the pistils have got pollen from another Cuckoo-pint, the stamens open and shed their pollen upon the flies below, and the hairs shrivel and open a way out. The flies, scenting the odour from a newly open hood, go in and repeat the process. In this way is produced the bunch of ripe, scarlet berries you will see at the hedge-foot next autumn.

Although we may find the Dandelion's fine golden flower-heads during eight or nine months of the year, it is in the spring that it makes the best show. Here is a good example, for it is growing apart and has room for the proper spreading of its large, boldly cut leaves in a great rosette. From the centre rise several leafless, hollow flower-stalks, each ending in a glorious head a couple of inches wide. Though in common talk

we speak of these as Dandelion flowers, we must not forget that, as in the case of the Coltsfoot, the packed head is a bunch of about two hundred little flowers or florets. But you will notice a difference in the make-up of the heads of the two plants. In that of the Coltsfoot the outer florets were long, slender and spreading (ray-florets), whilst those in the centre were bell-shaped with five lobes at the mouth (disc-florets). The florets of the Dandelion are all of one kind (ray-florets)—broad straps, notched into five teeth at the end.



DANDELION.

Plants with flower-heads of one or other of these forms are very common, and many kinds must be well-known to you—such as Daisy, Groundsel, Thistle and Hawkweeds. They abound in all parts of the world where flowers can grow; and their great numbers are thought to be due to the favour of visiting insects, for whom they provide honey. The insects in their calls carry pollen on their bodies and wings from flower-head to flower-head, and help to "set" the seeds. At this moment there are no fewer than four distinct kinds of bees on the several

heads of this one plant, and neither of these is a Honey-bee or Humble-bee. Those present are solitary Mining-bees that have issued from burrows in a sandy bank near by. The mother-bee last year dug it out with her feet and jaws, making a cell at the far end in which she left an egg with food for the grub when the egg hatched. This food is a mixture of pollen and honey kneaded together; and when it is eaten the grub turns to a chrysalis, and later becomes a bee, which waits for a sunny day in spring before making its way out from the burrow.

MINING BEE.

In May, when the Hawthorn leaves have spread themselves and turned the upper parts of the hedge green, and Jack-by-the-Hedge and Beaked Parsley have grown tall and put out their clusters of white flowers, hiding the bare lower stems of the thorn, we shall meet with life of another class. If we come in the evening after a nice shower of rain, we shall see dozens—perhaps scores—of one of the prettiest of our snails, gliding over the hedgerow plants. This is the Brown-

BROWN-LIPPED SNAIL.

lipped Snail, which has spent the winter among the dead leaves and has now issued from its usual haunt among the Stinging-nettles. The shell is some tint of yellow, and on this there should be laid five cleanly drawn lines of dark brown : there is also a brown line edging the mouth of the shell and a broader line inside it. I said that there *should be* five lines following the coils of the shell, because you will find that some have got the lines united into a solid band, whilst others have *lost* one, two, three or even four of the lines, but those remaining will be in their proper places.

III

SPRING AT THE POND

In early spring, before there is much spreading of leaf or opening of flower in the woods and lanes, there is a good deal to be seen in and around an old pond (Plate 8). By an *old* pond, I mean one that I have known for years : one that does not dry up in summer, though it may then have less water and a broader shore. To-day it is very full, owing to the snow and rain of winter ; but the water is very clear, for the leaves that almost filled it in autumn have all decayed and gone to form that fine mud at the bottom in which so many small living things find food and a home.

The great screen of Reeds at one end of the pond, that keeps up a steady rustle as the wind shakes it, is showing little sign of life ; but if you look down among the dead stems you will see many new green shoots showing in the shallow water. The Reed is the largest of all the British grasses ; it has a way of sending out shoots into the water from which new

stems arise ; and after a time the pond will get filled up by it, and we shall have to look for a fresh hunting place. The big blackish bird with the red forehead that has rushed out from among the Reeds with a loud cry of " cur-ruck," is the Moorhen. Probably there is a nest hidden there.

MOORHEN.

Under the Reed-shoots, and in the mud at the bottom, many forms of pond-life have passed the winter quietly, but are now active again, some of them making up for a long fast. The grown-up Frogs (Plate 9) that in autumn buried themselves in the mud, woke up in March and set about the laying of eggs in the pond. Though at first these were very small, they soaked up so much water that they soon became as big as peas, each a ball of clear jelly with a darker, solid centre which we may call the yolk of the egg, its most important part.

These eggs—of which one Frog produces a thousand or more—are soft and sticky, and all cling together in a great mass which now floats at the surface of the water (Plate 11). If we are able to watch them day by day, we shall find that the blackish

yolks soon begin to lengthen. A good plan is to take home a small portion of the jelly-mass and place it in a pan of water, with some fresh pond-weed, so that we can watch the changes closely. We shall see the yolk become long and narrow; soon we can make out which end will be the head, though when the head is formed, at first it has neither eyes nor a mouth. But it shows that the germ is alive; and a day or two later it gets outside of the jelly and clings to its surface. Then eyes and mouth and gills appear, head and body joined are finished off by a long tail, and we get near to the proper Tadpole form. The little animals grow rapidly; so that, when a large number have left the jelly-mass and are swimming in the clear water, the pond appears to be full of Tadpoles.

TADPOLES: NEWLY HATCHED AND WITH LEGS.

At this stage of growth, they are much like fishes, for they breathe by means of gills which extract air from the water; they swim like fishes by rapid movements of the tail from side to side. As they grow larger they lose the fish form: the head and body become round and a pair of tiny hind-legs breaks out from the base of the tail. The front pair is coming also; but

at present these legs are under cover and do not show. Then, as the legs grow and get strong enough to use, the tail becomes smaller, and by and by is not there. It has not dropped off, as some people will tell you it does, but has been absorbed into the body. The gills go also; and the young hopping Frog now breathes through its nostrils and lungs as we do. For a time, it will hide among the damp grass and weeds near the pond, and wait for heavy rain, when it will feel that it is safe to go farther away in search of a moist corner where it can find plenty of insects to serve it for food.

The early stages of the Toad's life are much the same as those of the Frog, except that the eggs are laid in strings of jelly instead of in a great mass. As a rule they are laid later than those of the Frog (Plate 11).

I said, a little while ago, that some pond-weed should be put in the pan with the Frog's eggs; and this advice applies to any of the pond animals that we are taking home in order to observe their habits. Many boys do not know or they forget this; and I had better make the reason for it plain. In order to live, all animals must keep their lungs or their gills supplied with fresh air, from which the blood takes a gas called oxygen and gives off another gas called carbon dioxide. Plants, on the other hand, take carbon dioxide from the air and give off oxygen. If

1 Pl. 10. **Smooth Newt in Spring dress (p. 39)** C 36.

Egg-mass of Common Frog (p. 34)

1 P. 11. Egg-ropes of Common Toad (p. 36) C 37.

you put Tadpoles or Sticklebacks in a jar with a small amount of water, they soon use up the oxygen that is in the air dissolved in the water, and are then poisoned by the carbon. But if there are living pond-weeds there also, these will use up the carbon and supply the oxygen that the animals need. If it were not that the grass, the weeds and the leaves of the trees give us all the oxygen we need, we should all be poisoned by an excess of carbon dioxide in the air.

There are many Sticklebacks or Tiddlers in our pond; and if we keep quiet and watch we shall see a party of the smaller and younger fish come out from among the weeds and swim off together through the clear water, looking for food. The fully grown fishes are less social in their habits; and we may see a solitary male peeping out from the jungle of weeds. We know him at once at this time of the year by the bright red of his underside, which contrasts strongly with his green back. Because of his fine colours we call him the Redthroat, and for the same reason some boys I have met with imagined he was not the same kind of fish as the greenish-grey ones—which are really the females.

The Redthroats are fierce fighters one with another; and when they engage in a duel, it ends usually in one being ripped open by the three upright spines on the back of the other. After putting an end to several of his rivals in this way, the Redthroat may set about

making a nest, for he is one of the few fishes that are known to build. To this end he gathers little scraps of roots and the softer parts of weeds, and makes a small pile of them on the bottom, perhaps roofing over a slight hollow if he can find one. With slime from his body he glues the scraps together. He pushes himself through the middle, in order to make it hollow;

STICKLEBACK GUARDING NEST AND EGGS.

and when it appears to be finished to his liking, he induces three or four (perhaps more) females to enter and lay eggs. He takes great care of these eggs, guarding them from others of his kind who would like to make a meal of them; waving his tail-fins at the door to set up currents of fresh water over them. When the eggs hatch, he takes the same care of the tiny Sticklebacks until they are large enough to look after themselves.

In some ponds, but not so commonly, we may find

another kind of Stickleback, smaller, and with nine or ten short, thin spines along the back, instead of the three stout spines of the commoner fish, which is known as the Three-spined Stickleback. The smaller kind is called the Ten-spined Stickleback : and at this time of the year the male is dressed in velvety black—so the boys call him a Tinker.

Other well-known members of pond society at this season are the two common Newts—the small olive or brown Smooth Newt (Plate 10) and the large blackish Warty Newt. These are spoken of sometimes as though they were Reptiles, but the Reptiles have their skin clothed with small scales or large plates, whilst the Newts, like the Frog and Toad, have their soft skins without any armour. They are pretty and graceful members of the pond folk, and better worth watching there than in a glass jar. Just now they are beginning to lay their eggs ; and if we watch quietly we may see how they take care of them. They are not laid in great masses, like the eggs of the Frog, but singly. Each is pressed against the lower side of a leaf of water-weed which is folded over it, so that the water can get to the egg, but it is not easy for a Stickleback to reach it.

From the Newt's egg, by and by, will hatch a little tadpole, but not one with a big head such as came from the Frog's egg. It differs, also, in being lighter in colour ; and when its legs appear, its tail instead of

getting smaller grows larger. After its tadpole days, the Frog has no use for a tail; but to the Newt its tail is of great value. By lashing its flat tail from side to side, the Newt swims quickly through the water; whilst its slender fingers and toes enable it to climb the weeds to find its food. Newts catch and eat worms, insects and other small animals. When they are fully grown, they leave the pond and live among damp moss and grass on land, coming back to the pond in spring to lay their eggs.

WHIRLIGIG BEETLE (ENLARGED).

Among the insects that swarm in the pond, there are many kinds of Water-beetles; and the first we see as we reach the pond are the giddy little polished Whirligigs on the surface.

A cloud passes over the sun, and at once the Whirligigs all disappear, dropping below the surface and hiding among the weeds. The cloud passes away, and the little company of beetles is back almost at once. They are not merely playing in these rapid circular movements: they are searching the surface for food, which consists largely of small insects that have fallen into the water and cannot fly up again. If by a rapid sweep of your net you can manage to catch one of these tiny beetles, you will find it well worth looking at closely. Under the rounded, glossy wing covers on the back is a pair of useful

wings with which it can make a journey to some other pond, if this one fails to please it. Like other normal insects that have reached their full form, the Whirligigs have three pairs of legs ; but the front pair is unlike the others. They are fairly long, and can be used for clinging to weeds or for catching the beetle's food ; but the other four are short and flat, serving as paddles with whose aid they swim so swiftly.

Other odd features of these Whirligigs will strike you, if you compare them with other water-beetles. The feelers (antennæ) are very short and thick, and look like ears sticking out of the head. The large compound eyes are divided, so that they appear as if there was a pair of eyes on the top of the head and a pair below. As the beetle skims the surface of the water, this halving of the eyes enables it to see above and below at the same time.

Among the many beetles of the pond, there are some that are much smaller than the Whirligigs, but there are others that are vastly larger. One of these, the Diver, is well-known to all the boys who come down to the pond after Newts or Tiddlers : it is about an inch and a quarter long, the male rather larger than the female. Both have a broad, dull yellow margin to their upper sides ; but there are two points in which they differ so much that you may suppose them to be distinct kinds of beetles. The male is nearly black and very glossy. The female is brown,

and though with almost as much gloss, this does not show so much in her case because the wing-covers have many deep grooves along half their length—ten to each cover. A further clue to sex is given by the first pair of legs: in the male these have the first three joints of the foot large and spread out, and on their under side there are two cup-shaped suckers with which the male beetle clings to the female. This front pair of legs in both sexes has a sharp double hook at the end of each foot, which enables the beetle to catch and hold its prey. The second and third pairs of legs are unarmed, and fringed with hairs to make them more useful as paddles.

DIVER-BEETLE (FEMALE).

In the grub stage, our Diver is a long yellowish crawler on the bottom, looking something like a shrimp, with a pair of large, curved hooks on front of its closed mouth. Fixing these sharp hooks in the body of its victim, it sucks its blood through a groove in the edge of the hook. It is so active a killer that the boys know it as the Water-tiger, perhaps without knowing that by and by it will turn into a Diver-beetle. After five or six weeks of steady feeding, it becomes

full-grown; it then creeps out of the water and hollows a cell in the soft bank and changes into a chrysalis, later turning to a full-sized beetle.

The Diver spends most of its life in the water; but as it has a pair of strong wings under its wing-covers, it sometimes flies at night to some other pond where it may decide to stay. Like other insects, it breathes air; and its way of doing this is worth notice. If you are merely watching, instead of catching, the life of the pond, you will see the Diver come to the surface and hang there for a moment, head downwards with the tips of its wing-covers slightly in the air. There is a space between the curved, close-fitting wing-covers and the beetle's back, where it carries a supply of air. Along each side of the back there are tiny doors to the tubes which carry air to all parts of the beetle's body; so that, when it is under water, the beetle can breathe by drawing upon the supply of fresh air held under its wing-covers. When this is all used up or tainted, it rises to the surface, presses out the foul air and takes in a fresh supply.

There is a water-beetle that is larger than the Diver, but it is not to be found in every pond. It is known as the Black Water-beetle, for though it may not be quite a true black it appears to be so until looked at closely. Its back is more rounded, less flat, than that of the Diver; and it is not a "beast of prey," its food

being water-weeds mostly, though in the grub state its habits are much like those of the Water-tiger. In netting the water-weeds you are likely to see attached to some of them what appears to be a fairy paper bag screwed up. It is really a packet of eggs, left by the female of the Black Water-beetle; the female Diver lays her eggs in slits cut in the stems of the weeds. From the eggs of both kinds hatch out tiny water-tigers, which by steady feeding on other insects, snails and so forth, soon become the large shrimp-like creatures that attract our notice.

BLACK WATER-BEETLE.

Looking at the head of the Black Water-beetle, a pair of long slender threads will be seen that may be

BLACK WATER-BEETLE'S EGG-PACKET.

mistaken for the "horns" or antennæ; but they are really feelers that belong to the mouth—the true

1 Pl. 12. **Boatman (p. 46)**

Water-Scorpion (p. 47) D 44.

1

2

3

4

1 Pl. 13. **Flowers of Spring** D 45.

1. Wood-sorrel (p. 67); 2. Wood Anemone (p. 68); 3. Bluebell (p. 70); 4. Primrose (p. 69).

antennæ may be hidden under the head. If we can get a good view of them we shall see that they have knobbed ends, and that each knob is made up of four joints that are curved, so as to be hollow on the underside, where they are fringed with bristles, with which a sort of funnel is formed. The lower surface of the beetle is downy, and among the hairs air becomes entangled and shows silvery under the water. This layer of air connects with the supply under the wing-covers. It is said that when this air becomes stale, the beetle has only to go to the surface and put up its antennæ funnels, when it can draw air down them to its under-parts and wing-covers.

There are other points in their methods by which the two large beetles differ; and by watching them in the pond we shall see some of them. The Black is more a crawler than a swimmer or diver, though he does both these things; but if he needs to swim his efforts are rather lop-sided. His legs are feathered, but not so fully as those of the Diver; he moves only one of a pair at a time. The Diver, like an expert boatman, spreads forwards both of his hind-legs at the same instant, and presses them backwards firmly like a pair of sculls, and shoots straight through the water.

We have written at some length on these two beetles because they are so large that they attract attention; but there are scores of smaller kinds in the pond,

some no bigger than a pin-head, each with a way of its own, and therefore worthy of our study.

Beetles are by no means the only water-insects in the pond: there are many Bugs that spend the whole of their lives there, as well as other insects—Dragon-flies, Caddis-flies, Gnats, even Moths—which pass their early and longest stages in the water. There, just below the surface, resting back downwards, with his head a little lower than his body and his long hind-legs spread out like a pair of oars, lies one of the most striking of the Water-bugs, known by the fitting name of the Boatman (Plate 12). The boat is his body, flat below and keeled above; but as he prefers the upside-down position, the keel comes into its proper place. See, when I disturb him, how finely he uses his oars and propels himself swiftly through the water! No other name would suit him half as well; though most people call him the *Water* Boatman, which is like speaking of a human man. Catching this one in the net, we can turn him right way up and see that his back is not covered with hard shields like the beetle's back, but the wings are folded tightly one over the other, and coloured black and a pale yellow tint. Turning him over again and looking at the underside of his head, we see another point in which all Bugs differ from Beetles. The Beetles have the mouth fitted with cutting jaws with which they bite: in the Bugs these parts are changed into a jointed beak with

which they pierce the skin and suck the blood of other insects, snails, tadpoles and fishes. The Boatman, you will see, has a fairly long beak; and when he tucks in his head the beak lies with its point out of the way between the bases of the first pair of legs.

You will find that there are several kinds of Bugs in this one pond, most of them differing from the Boatman in having flat instead of keeled backs. They differ from the Beetles in having no proper grub stage: they leave the egg in much the same form as when they are fully grown, except that at first they have no wings—in some kinds these never grow to a size large enough to be used for flying.

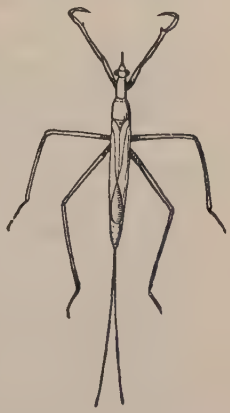
Several of the Water-bugs are common in most ponds; and perhaps the best-known of them is the one called Water-scorpion (Plate 12), with a long-oval body about three-quarters of an inch long and half as much broad. It has very little thickness from back to front, and looks as though it had been pressed in a book. If you have ever seen a real Scorpion, you will know that Water-scorpion should never have been given to it for a name, for the real Scorpion has a pair of nippers on its front legs. If a likeness was to be drawn from the front legs, it would have been better to call this Bug a Water-mantis, for the two last joints of its legs close down into a groove in the thicker next joint, just like those of the Mantis.

However, it is well-known as Water-scorpion, and we had better speak of it by that name.

The Water-scorpion spends a good deal of time on the mud at the bottom, and as his colour is a dingy dark brown he is not very distinct when there: he is just waiting for something to come within reach of his front legs, which close upon it and hold it firmly whilst his sharp beak is pushed into the victim, whose blood is sucked. At the hinder end of his body there sticks out a pair of bristles, which are grooved down one side. Sometimes you may see this big Bug clinging head downwards to a weed, with the bristles pressed together and their tips out of the water. So placed, they form a tube, down which he draws a fresh supply of air for breathing purposes. In spite of his dull and shabby looks, the Water-scorpion has a patch of bright colour, but he keeps this covered up by his folded wings. When he leaves the water in the evening and spreads his wings in flight, you would scarcely know him for the same insect, for his flat back is coloured bright scarlet.

Another of the Water-bugs has the Mantis-like action of the joints of its front legs; but it is not to be found in all ponds. This is the Water Stick-insect, though the true Stick-insect like the true Mantis is a relation of the Grasshoppers and Locusts. This Water Stick is a long, slender, pale brown insect that looks like a joint of dead grass-stem, and its legs

are very long and thin. It appears to be much longer than it is because the two bristles at the tail end are almost as long as its head and body. It uses these to make a breathing-tube just as the Water-scorpion does. A further length appears to be given to it by the strange position of the front pair of legs. In both these bugs the first pair is joined to the body close to the eyes, and whilst those of the Water-scorpion are elbowed out to the side, the Stick holds his mostly in front of him, with his stout beak between them. They are not used for walking or swimming, but only for catching its food, which is sought among the weeds, insects and baby "tiddlers" being the chief victims.



WATER STICK-INSECT.

The wings are broader than the Stick's body, and have to be folded to get them under the narrow wing-covers. If, in the evening, you were to see these spread for flight, you would find that the back is coloured red, like that of the Water-scorpion.

Two other sorts of Water-bugs we shall find in numbers swimming about under water, hunting for a meal. One of these is the Corixa, somewhat like the

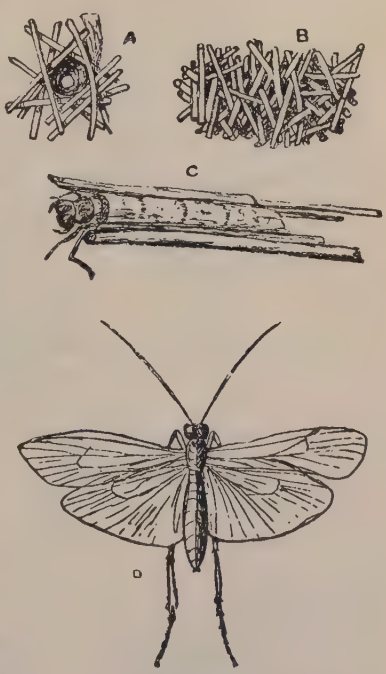
Boatman but a little smaller and with a flatter back. Out of the water and dry, you will find that he is so glossy as to appear still wet, whilst the Boatman is so dull as never to look wet. His colour is olive, closely dotted with short wavy lines of a darker tint, and his large triangular eyes, being dark, show up very strongly from his pale yellow face, much as do those of the Boatman. He is of pretty equal width from front to back, where he is more rounded than the Boatman; his legs, too, are shorter, and you will notice that each pair differs from the others. Those of the front pair are very short and curved, ending in a sharp spine and with a fringe of hairs on the lower edge. These are for holding anything securely. The middle pair is the longest of the three, and each foot ends in two long, slightly curved spines as sharp as those on the leaf of a thistle. The two hind-legs are fringed with hairs along their lower edge, so that they serve as a pair of oars: but Corixa, unlike the Boatman, always rows with his back upwards.

CORIXA-BUG.

NAUCORIS-BUG.

Something like Corixa but oval in shape, is another Bug called Naucoris. The sides of his body are curved, and each joint bears a spine on each side, so that his outline is something like that of a toothed leaf. The front pair

of legs remind one of those of the Water-scorpion, though they are much smaller and mostly out of sight; the last joint is a mere spine, but it folds down into a groove in the edge of the much thicker next joint. The second and third pairs of legs are longer, spiny, and end in sharp double hooks.



CADDIS.
A. END VIEW OF CASE; B. SIDE VIEW; C. CADDIS-WORM IN CASE; D. CADDIS-FLY.

When we have learned all about these larger of the Water-bugs, and feel that we should like to know other insects of the same tribe, we can come back to the pond and hunt for several smaller kinds which live here. For the present, we will be content with these more distinct kinds, and look for some other

insects that are moving about the bottom. Unless we have met with them before, some of these moving objects may be rather puzzling. They are little tubes, an inch or less long, some made of grains of sand, bits of gravel, leaves of pond-weeds, short bits of twig, small snail-shells, fragments of grass-stems, or any other small rubbish that finds its way to the bottom. These are known as Caddis-cases.

If we scoop up a few of these and put them in our bottle, we shall be able the better to see just what they are. We see now that they are hollow; and from the end of one a brown head and six legs are put out. This is the front part of the builder of the case: he is known as a Caddis-worm, though he is not a worm but a grub—the first stage in the life of an insect known as a Caddis-fly. This is not a true fly, for that has only two wings whilst this has four. The Caddis-flies are much like moths, but their wings are covered with hairs instead of the minute scales which cover the wings of moths and butterflies and give them their bright colours. Most of the Caddis-flies, which a little later may be seen sitting quietly on trees and fences near the water, are dingy-looking insects which escape the notice of people who are not on the look-out for them.

The eggs of the Caddis-fly are dropped into the water, all glued together. Like the eggs of the Toad, they all soak up a lot of water, and become a rope of

1 Pl. 14. **Flowers of Crab Apple** (p. 74) D 52.

I Pl. 15. **Nightingale on her nest (p. 72)** D 53.

jelly which clings round one of the weeds. When they hatch, the tiny Caddis-worms feed for a short time upon the jelly; then they drop to the bottom and search for fragments from which each can begin the building of a case to protect its tender body. The fragments are held together by fluid silk from the grub's mouth, which hardens under water and forms a smooth lining. Into this lining the grub sticks the hooks of its hind-body, and so is able to pull the case along. If you can induce the full-grown grub to leave its case, you will see the reason for making it; only the head, legs and front part of the body are protected by a hard brown skin, the rest is white and soft, and if seen would cause the Caddis to be eaten by fish or bug or dragon.

The "Dragon" I mean is the grub of the Dragon-fly, of which several kinds may be seen crawling over the bottom, some half buried in the mud. You know the Dragon-flies quite well! The gauze-winged insects that flit lazily about the waterside, or the larger ones that speed like airplanes along hedgerow and woodside, catching and eating other insects. Well, whether they are slender-bodied small ones, the flat-bodied larger kind or those with long, round bodies that country folk wrongly call "horse-stingers," they all begin life in the pond. Although later on, when many of them will have left the pond to spread their glittering wings in the sunshine, we shall spend

much time in admiring their beauty and skill, we shall find greater interest in them as pond insects. There are more than forty kinds of Dragon-flies to be found in Britain; but for the present we need not bother to sort them out—as dragons of the pond they are much alike in their structure and their habits. Like the Water-scorpion and the Boatman, the Dragon-flies are active all their lives: the splendid wings forming by degrees and not needing a resting stage for their growth, as required by the beetles and butter flies.

DRAGON WITH MASK RELAXED.

We see these Dragons crawling slowly over the bottom as a rule; but now and then one will shoot quickly to a distance without using his six long legs. How is it done? We will get that large Dragon with the broad body into our bottle, where we can get a clear view of him and of his movements.

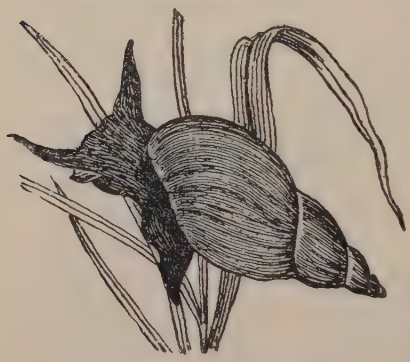
He is about two inches long; and it is easy to see that, like all insects, he is built up in a series of rings. His broad, flat head owes much of its width to the pair of large eyes. Between the head and the long hind-body, we have the rather short fore-body to which the six legs are jointed below, whilst from its upper side project four hard packets in which the

future wings are cramped. The hind-body ends in several long, pointed flaps which close in a sharp point when the Dragon is crawling or at rest. But when he wishes to pursue an insect at a distance, these flaps open and a jet of water spirts out with force, sending the Dragon the other way. Inside at this part it has a space lined with delicate air-vessels which connect with the air-tubes that branch all through the bodies of insects for breathing. The Dragon has to get all his fresh air from the water, as Tadpoles and Tiddlers do, though the method differs. The Dragon opens the valves and expands his body, causing the water to rush in and fill the space; when all the good air has been taken from it into the tubes, the used water is got rid of by contracting the body and forcing it out. This may be done gently without our noticing it; but if the Dragon wishes to move quickly, the pressure is greater and the spirt results.

But there is another part of its structure which I ought to point out to you, for there is nothing like it in our other insects. This is spoken of as the Dragon's mask : it is really its lower lip, lengthened and hinged so that it can be folded close against the face, or shot out suddenly to catch an insect in its pair of hooks. We may be coming this way one fine day in summer and see the Dragons climbing the Flags and Bur-reeds out of the water, then splitting

their skins and drawing themselves out as limp Dragon-flies. That is a sight that is worth seeing.

At the present time, there are many more things in the pond of which you should know, if you have not found them by yourself. You know at least some of the Pond-snails, of which there are several kinds in sight at the present moment, either sliding over the bottom and feeding on the green silky Algæ, or climbing the larger water-weeds and eating their leaves. One of these is so large that we cannot help seeing it, and it is known as the Great Pond-snail because of this fact. Its shell, which is two inches long, is shaped very like that of the Whelk, only instead of being stony and heavy, this is thin and light. As a rule the pond-snails, like the land-snails, feed upon plants; so does the Great Pond-snail, but he also enjoys a dead frog or fish when it comes his way.



GREAT POND-SNAIL

Although snails are mostly killed at sight, because the garden ones eat our vegetables and seedlings,

they are wonderful creatures and worth knowing. Soft and jelly-like as they are, they have the power of building a house that is also a garment, that can be carried wherever they go, and that lasts them for life, getting larger as their growth needs more room. On some of the weeds you will see sausage-shaped blobs of pale jelly in which are the numerous eggs of this snail. When the eggs hatch the baby snails already have very thin shells. They make their first meal of the jelly, and then attack soft, decayed leaves of the weeds. They grow quickly, and would soon be too big for their shells. But the snail itself has a soft covering called the mantle, and the edge of this is always adding to the mouth of the shell in such a way that the shell always turns its mouth from left to right, forming a spiral tube twisted around a central column. This is a splendid plan, for however long the snail lives there is no need for him to moult, as the insects and crabs have to do.

There is another wonder which the Great Pond-snail shares with all the other kinds of snails. In all these we can find that, much like ourselves, they have stomach, heart, liver, muscles and nerves, but their mouth parts are quite different. Looking at this snail as it climbs up the inside of our bottle, we see the broad "foot" (as its base is called) pressed against the glass and showing ripples as he glides. In front of the foot, the head spreads out with its pair of long,

wedge-shaped feelers, with the eyes at their base. Below these is the mouth, with a horny jaw that grips the food, whilst what looks like a tongue rasps it to pulp. This "tongue" is really a narrow ribbon, rolled up like a watch-spring, across which are fixed

ROW OF TEETH FROM "TONGUE" OF GREAT POND-SNAIL.

many rows of hook-like teeth; and it moves forwards and backwards in such a way that the points of the hooks tear up the food. If we took this scraper from a dead snail and looked at it under a microscope, we should find that there are no fewer than a hundred and ten rows, and that each row includes a hundred and nine of the hooks. Of course, only a few rows come into play at one time; but when one row gets worn blunt, another row from behind comes into use.

SHELL OF WANDERING-SNAIL.

Several other kinds of snails are to be found in ponds, but not in all ponds. One of them, however, shaped something like the Great Pond-snail but only a quarter of its size, is to be found almost everywhere. This is the Wandering Snail — so-called from its habit of leaving the water and gliding through wet grass from pond to pond. It has a shorter spire than its large relation, and the newer portion

of the shell ("body-whorl") is larger in proportion.

The class of animal life to which these snails belong is known as the Mollusca, and the animals themselves are mollusks; but not all mollusks are snails. I see that in one of the bottles you have mollusks of another type—those which have the shell in two pieces or valves, like those of oysters and mussels. These little ones in your jar are known commonly as Freshwater Cockles; but it is not a good name, for there are several points in which they differ from the real Cockles of the sea-shore. The ones you have are known also as the Horny Orb-shell, from the brownish colour more than from the texture of the shell. The two valves are hinged together at the beaks, and are kept closed at the will of the animal by means of strong muscles. With the valves partly open, it thrusts out its tongue-like foot at one end, and at the other its two siphons. Although it has a mouth it has no head, and the mouth is without the snail's rasping tongue. Its food consists of the minute particles that are floating in the water, so small that they require no finer division. It breathes by means of gills: and one of the siphons brings in a steady stream of water that passes over these and then passes out again through the other siphon. The food that comes with

HORNY ORB-SHELL.

the water is passed on to the mouth. With the delicate little foot he can bury himself in the mud, or use it for climbing the weeds, lengthening its tip and curling it around a stem. With it can also be spun a gummy thread, with which the mollusk can lower itself from the surface to the bottom.

There are several other sorts of Orb-shells, and the similar but smaller Pea-shells, but they are not all found in this pond. We may consider some of the others another day.

Well, now: we have taken note of many of the living things that dwell in this pond, as well as in most other ponds that are a few years old; but it is only a sample of what might be found in a series of visits at various seasons. The water-plants we will leave until their flowering time comes, when we must pay a second visit. On their stems and leaves, too, and floating freely in the water, there are hosts of minute wonders that could be shown to you only through a microscope; and that is not work for the pond-side, but for the study. We will put a handful of weeds and some pond-water into this other jar, and explore it at home.

Oakwood in Early Spring [p. 61]

1 Pl. 17. **Flowers of Spring** E 61.

1. Yellow Archangel (p. 71); 2. Germander Speedwell (p. 79); 3. Wild Strawberry (p. 73); 4. Early Purple Orchis (p. 81).

IV

SPRING IN THE WOOD

BEFORE we enter the wood proper from the common we have to cut through a broad band of copse or underwood—which is really only another way of saying " young wood," for if it were allowed to grow the trees would get tall and thick like those in the old wood (Plate 16). But the copse is cut down every ten years or so, leaving the stumps, from which in the years following straight shoots arise which will serve for hop-poles, for fencing and for firewood. To get straight growth of this small wood, the copse is allowed to become thick ; in places we shall have to push a way between the rods.

There are young trees of several kinds in the copse, but the one that attracts our attention early in the year—before what we consider spring has begun—is the Hazel or Nut-tree. September is a long way from February, whether we reckon forwards or backwards ; and few persons connect the long, swaying, yellow catkins of the earlier month with the sweet

brown nuts of autumn. Yet one of two links is always visible to the observant rambler or Nature-scout. When he is filling his pocket with the crisp fruit that is to be the dessert of his wayfaring lunch, he cannot help seeing that these same catkins are formed already and are hanging in pairs from the long, slender shoots. But in the autumn they are only about half an inch long, solid and hard and of green-grey colour. Towards the end of January, having grown slowly through the winter, they lengthen to two inches, become limber and bright yellow, the scales separate and reveal the tiny flowers that they cover. Looking at them closely, we then see that each catkin is composed of a hundred or more flowers: all males.

CATKINS OF HAZEL.

If we cut off a short length of twig bearing a few of the catkins, we may get to know them better; and it may help us at the same time to understand the catkins of Alder and Oak when we come across them, for they are built on much the same plan. We shall see that each scale is a bract (such as we find under

many other flowers) with its front edge cut into teeth. These bracts are placed in spiral lines around the stem of the catkin; and under each bract we find four forked stamens, from whose swollen tips—the anthers—the fertilizing yellow pollen is set free, to fly off in little clouds.

Of course, to realize the true structure of the flower-spike we call a catkin, we have to bear in mind that we are looking at it upside-down: hold it by its tip and you will see that the bract comes, as is proper with bracts, under the flower, which in this plant has neither sepals nor petals. Flowering at a season when there is often much rain which would wet the pollen and prevent its flying, the Hazel hit upon the plan of the hanging catkin, which turned the bract into an umbrella and so kept the pollen dry: it did away, also, with the need for petals.

But, you ask, why produce so much pollen when there are no pistils to receive it?

Now look at the upper end of our twig. These round knobs that you have taken for leaf-buds about to open are really the female flowers, and these fine crimson threads are the styles of the pistils. About sixteen of them protrude from each "bud," which means that there are eight flowers, for each one has two styles. Like the males, these female flowers are very simple. Their object in putting out the crimson threads is that these may catch a little of the pollen

that comes flying from another Hazel—for, it will be seen, that their position above the level of the male catkins makes it unlikely that they will receive any from their own tree. Like many other plants, the Hazel prefers that its seeds should be fertilized by pollen from another tree of the same kind: and that is why it ripens its male catkins before the boughs are covered with big leaves that would get in the way of the flying pollen. Our larger forest trees follow the same plan, though it is a very expensive way, for most of the pollen is wasted by falling to the ground. The plants with showy flowers that offer nectar as a bribe to insects to visit them, need to provide only a small amount of pollen, for the insects are careful carriers and take it where it is wanted to be placed.

DORMOUSE.

Who took the trouble to fix that ball of bark-shreds on this Hazel stem? That is a last summer's nest of the pretty and gentle Dormouse, who is now sleeping, probably underground among the stubs near by. He will stay there for some time yet—until the copse is leafy and there are insects to be caught for food; unless he has still a few of the nuts he stored in autumn. The Dormouse is a good sleeper, but he wakes up

at intervals during the winter in order to enjoy a meal and retires again.

Among the first of the ground plants we shall find in flower in copse and wood is the large Wood Spurge; and being two or three feet high, with strange-looking flowers, it is a very distinct item. Like the Hazel, it is a plant that does not owe its showiness to the bright hue of its petals, for it has neither petal nor sepal. Its flowers are of the simplest, and we should scarcely notice them but for the large pale yellow bracts, whose lower edges are joined. From the centre of each of these yellow plates come several slender stalks which end in what we may call saucers, in which are the actual flowers. Here again, we may be deceived, for we find a cup with five lobes between which are four broad horned glands; and in this are the real flowers, several males and one female. The male flower consists of a single stamen with a jointed stalk. The only female comes from the middle of the group, and consists of a single pistil on so long a stalk that the flower hangs out over the side of the cup.

WOOD SPURGE.

The Wood Spurge is a perennial herb—that is, it lives for at least several years, flowering more than once, whilst an annual or biennial plant flowers only once, then dies. This Spurge started from seed and built up a short, stout stem in its first year, but did not flower. You can tell which is the old part by the bronzed leaves. This year it has almost doubled its height, and the new parts are all yellowish, with many slender flowering branches. If you break off any portion, you will find that the sap is milky; it is also poisonous.

DOG'S MERCURY: SHADE AND SUNSHINE PLANTS.

Another perennial plant, related to the Spurges, is this dark-green Dog's Mercury that forms large clumps in copse and wood, and is one of the earliest to put out its strings of small green flowers. These are less simple than those of the Spurges, for though they have no petals they have sepals, but only three of these. The leaves are either lance-shaped or narrow ovals,

with toothed edges. Now, there is a fact about this plant that it would be well to notice. If you look over the many clumps that are around us, you will see that the plants that grow where they get the sunshine have long, drooping sprays supporting a large number of flowers; whilst those that grow in the shade have quite short, stiff spikes on which there are only two or three flowers. If now you take the pocket-lens to help, you will find that the flowers on the long sprays have stamens, but no pistil, whilst those on the short spikes have a pistil but no stamens. The pollen has to be carried by wind or insects from the sun plants to those in the shade. When the grey seeds are ripe, the capsule explodes and throws them several yards, perhaps so that some of them may get into the sunny places.

A similar method of sowing seeds far away from the plant that produced them will be seen in the pretty Wood-sorrel (Plate 13), whose crimson thread-like stems and yellow-green leaves, cut like Clover into three heart-shaped leaflets, are clustering round the stubs. From April onwards, over these clumps of leaves will be poised the graceful, drooping flowers, their white petals veined finely with purple. The flower has five sepals, five petals, ten stamens, and the pistil has five styles. During the summer it has a second lot of flower-buds, but these do not open, though they grow into seed-capsules all the same.

Whilst the seeds are ripening, the capsules are hidden away under the leaves; but when they are ready to sow the ripe seeds, the long stalk straightens and lifts up the capsule clear of the leaves. Every ribbed red seed has got an outer elastic jacket, and this, held in a slit of the capsule, turns itself inside out quickly, shooting the seed away to a distance.

A little before the Wood-sorrel shows its flowers, the floor of wood and copse becomes covered with another of our favourite spring flowers—the Wood Anemone (Plate 13). In an average spring we may expect to find Anemones before the end of March, and they appear quite suddenly, because, being perennials again, they have got the stuff of which leaves and flowers are made stored underground in a fleshy rootstock. The leaves come up singly on a tall, slender leaf-stalk; but you might be inclined to call it a stem with three leaves. This is because the one leaf is cut into three leaflets, each looking like a complete leaf from its being divided into what look like smaller leaflets with their lobes and large teeth. The tall flower-stem comes up apart from the leaves, but it has three leaves of its own whose special purpose is to wrap up the purple flower-bud when it pushes through the earth; then the stalk of the bud lengthens and lifts it up before it opens to show the white insides of its sepals. The Anemone has no petals, so the sepals have been enlarged and coloured to serve in

1 Pl. 18. **Catkins of the Alder** (pp. 62, 91) E 68.

1 Pl. 19. **Brimstone Butterfly (p. 75).** E 69.

1. Egg, natural size; 2. Egg, enlarged; 3. Caterpillar; 4. Chrysalis.

their place. There are six sepals usually, but there may be one less or a few more. There are many stamens surrounding a central knot of short pistils, which are much like those found in the Buttercups, the Anemone being a member of the Buttercup family of plants.

The Primrose (Plate 13) appears in force in the woods and copses before the Anemone has done with its display, again by drawing upon underground stores laid up by the Primrose leaves after last year's flowering. We all know the Primrose in the mass as it makes its splendid show in the woods, and we know its gathered flowers in the bunch, for the plant is one of those lovely common things that are to be found in all parts of the British Islands. But, we fear, very few of those who visit the woods eagerly to see and gather the pale blossoms take trouble to find out about the plant as a whole. Yet there is something of interest in every plant, and we cannot say we really know the flower unless we have made a little inquiry into the structure and habits of the plant that produces it.

The mature Primrose-plant has a thick, fleshy rootstock buried slightly, from which the almost stalkless, wrinkled leaves spring directly, more or less in a circle, and from the centre there grows a short thick stem, and from the top of this arise many flowers, each with a slender footstalk as long as the leaves. This grouping of the flowers is much like that of the

different-looking Cowslip; but there the footstalks are short and the general stem is long, so that the flowers are lifted far above the leaves. Sometimes, the Primrose lengthens its stem in like fashion, so that its flowers are all in the air; then people call it an Oxlip, but the real Oxlip is a distinct plant.

Whilst the wood is still bright in parts with Primrose blossoms, other parts of the floor become covered with a splendid blue carpet, formed by the tall spikes of Bluebell (Plate 13), of which thousands are crowded in quite a small space. So close are they, that from a short distance the blue appears to be continuous. The production of so vast a crowd of flowers at one time is made possible, in this case, by the packing into a little bulb of the plant-food made last year. When the flowers we are looking at now have faded, and their pistils are ripening into seed-vessels, the narrow, straight-sided leaves will grow until they may be a foot and a half long, and will work hard to fill themselves with food. In some way they seem to know that the Bracken, which is already showing, will soon cover the place with its great fronds, capturing all the light, and so stopping work for the smaller plants. All this new stuff will be passed down through the long leaves, far underground, to fatten the bulb and form new leaves and flowers for next spring. Some plants, you see, are thrifty, and look ahead to next year's needs.

Here, too, is another of the Dead-nettles, a taller one than the Red Dead-nettle we met with along the hedgerow—where sometimes we may see this kind, as well as in the copse. This larger kind is known commonly as the Yellow Archangel (Plate 17), and is a perennial plant. Some of the stems from the short rootstock run along the ground and never flower. The stems that bear the flowers are quite erect, about two feet high and four-sided. The large, oval leaves are always in pairs : they have stalks and their edges are cut into large teeth. If you look at the bottom of one of these flowering-stems, you will find that it is covered with sharp bristles, and I think the reason is to prevent slugs and caterpillars from climbing up. You will find also the same kind of hindrance below each node—that is, the joint from which a pair of leaves and a ring of flowers start off from the stem. Each ring (whorl) is made up of six to ten flowers, which are much like those of the Red Dead-nettle, but besides being yellow have larger lips, the upper lip more erect and the lower striped and spotted with brown.

For some time we have been getting short bars of the Nightingale's song, whose " jug-jug " is not mistaken easily for the notes of any other of our birds ; and now we are in near view of the graceful, if plain-coloured singer—look at that slender bough of the Oak just ahead. You may depend that we have

not far to seek for his mate on her nest and eggs. And here it is, only a few yards from the same tree, partly hidden by a clump of Wood-sage, but revealed by the hen bird who is sitting on her eggs (Plate 15). We have come a little too near and she has taken alarm, slipping off and letting us see that she has five glossy olive-brown eggs without any markings. The nest itself is rather a poor affair, little more than a mere lining of grass and fine roots set in a heap of dry oak-leaves. Still, it serves its purpose as a nursery, and that is all a bird expects from the most cleverly designed nest. These eggs—there are seldom more than five—will be hatched in a few days, when both birds will be kept busy hunting for insects to feed their young. As you know, we never see the Nightingale in this country until late in April, and it stays with us for little more than three months, during which the nest has to be made, the eggs laid and hatched, and the young birds matured enough to

NIGHTINGALE.

enable them to start back to the winter haunts in Africa. The shortness of its visit, and the fact that it cannot thus early rely upon getting much insect food except in the south, may account partly for its absence from the extreme north of England and from Scotland and Ireland.

The bright little butterfly with brownish-yellow wings spotted with black, flitting about in the open spaces, is the Pearl-bordered Fritillary (Plate 5). When it settles for a moment and turns its wings up over its back, you see the reason for its name on the underside of the hindwings. On the outer margin of the wing there are seven silvery spots; there is a smaller one near the body and a larger one in the centre. This is one of the prettiest of our butterflies, and its chief business just now, newly issued from the chrysalis, is to lay its eggs on the Wood Violet, upon which the black, spiny caterpillar feeds.

The Wood Violet, with its rosettes of dark heart-shaped leaves and scentless blue flowers is all around us on the low banks; it continues in flower for several months. Among the other low-growing plants are several now in flower that most people know at sight, such as the Wild Strawberry (Plate 17) whose red, acid-sweet fruits we shall be coming out to seek a little later. At present the sprays of white flowers above the bright green trefoils present a

pretty sight; a few have already cast their petals and show us the beginning of the fruit.

Strawberry, however, is not the only wild fruit of which we may see the beginnings in this wood: the small tree ahead with widespread branches covered with large pink and white flowers is the Crab or Wild Apple (Plate 14). This is a good chance for comparing two flowers that are built on the same general plan, but varied so that they produce fruits that are quite unlike one another. They both belong to the Rose family, but, to begin with, they are clustered in different ways. Those of the Strawberry form a loose spray, whilst those of the Apple are in an umbel—that is, the half-dozen flowers in the cluster have stalks of equal length which all spring from one point like the ribs of an umbrella. The Strawberry flower has a large number of pistils scattered over the rounded base of the flower, above the calyx, which swells up and becomes juicy and red in the fruit, when the pistils become the scattered "pips."

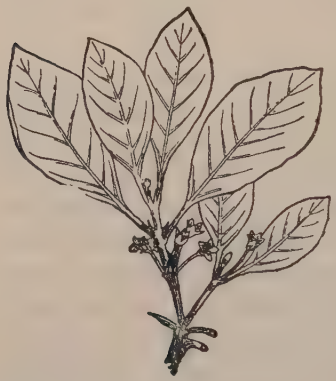
In the Crab flower there are only five pistils, which are hidden in the calyx-tube and united. Here the fruit is formed by the calyx-tube becoming fleshy and swollen, and in the centre the united pistils will be found forming the "core" with five cells, each holding a pip or two pips. You can see the first stage of this by cutting down through the flower and its stalk; the last stage you must have found out by eating

dessert Apples. We must remember to come back to this tree in autumn when it will be covered with the red-streaked yellow crabs. The many bees that are humming in the blossoms now are doing their best to "set" the fruit. It is from the wild Crab that, in the course of ages, all our orchard Apples have had their origin.

All the morning we have been seeing at intervals the Brimstone Butterfly flitting across our path; there goes another of a paler tint, which means a female, and she has settled on a small tree, no doubt for the purpose of laying eggs. As I thought, the tree or large shrub is the Alder Buckthorn, so that she calls our attention to another woodland plant that is now in flower. She was under that leaf, but has now flown off again. Let us enquire. On the underside of the leaf there stands on end a single bottle-shaped, greenish-white egg (Plate 19), from which, in about a fortnight, will hatch out a blue-green caterpillar. In spite of its mother's care in placing her egg where it would not be seen, the tiny caterpillar will at once crawl to the upper side of the smooth leaf, and spin a little pad of silk to give it firm foothold. And on the upper sides of leaves it will feed until it becomes a chrysalis; but as its colour is the same as that of the leaf, it does not appear to be noticed except by sharp-eyed Nature-scouts like ourselves!

The butterfly having called our attention to the

plant, let us enquire into it. There are two kinds of Buckthorns in our woods, this Alder Buckthorn, which has no thorns, and the Purging Buckthorn some of whose branches harden into spines. That kind is not in this wood; it has a greater liking for chalk soils, and we shall find it in thickets on the Downs. This Alder Buckthorn is so called because its leaves are thought to be like those of the Alder tree, though only half the size. Its stem grows only to a height of ten or twelve feet, with many slender branches clothed with purple bark. The oval leaves have no teeth, a fact that serves at once to separate this plant from the other whose leaves have small teeth all round their edges, and the nervures (veins) of the two are not alike. The small clusters of tiny greenish-white flowers vary from three to seven, and issue from the angle between leaf-stalk and stem. The five lobes of the bell-shaped calyx are larger than the petals, which at first have a curious way of each wrapping round one of the stamens.



ALDER BUCKTHORN: LEAVES AND FLOWERS.

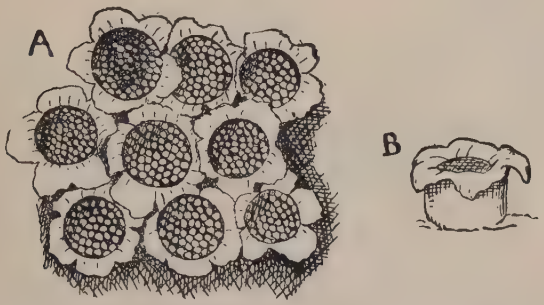
1 Pl. 20. **Furze-bushes in flower (p. 91)**

Seedling Furze (p. 93) F 76.
showing change from leaf to spine.

1 Pl. 21. **Mosses and Lichens** F 77.

1. Swan-neck Thread-moss (p. 97); 2. Cup-moss Lichen (p. 87); **3.** Yellow Wall Lichen (p. 88); 4. Reindeer Lichen (p. 86); 5. Schreber's Feather-moss (p. 90).

Some of the twigs and leaves bear blotches of bright yellow which, I think, are more plentiful at times on the Purging Buckthorn, for I have seen it with every leaf so marked. If you examine one of these blotches with the lens, you will see that it consists of a large number of closely-packed waxy cups, which are known as the Buckthorn Clustercups. There are many kinds



CLUSTERCUPS: A. GROUP OF CUPS; B. SIDE VIEW OF A CUP (ENLARGED).

of Clustercups, and you will find some of the others on Anemone, Violet, Lesser Celandine, Barberry and many other plants. They are stages in the life story of fungi that cause plant diseases known as Rusts and Smuts. Some of these are at times the cause of serious loss to the farmer, for his ears of wheat may contain only a black powder instead of grain.

Here, on this bank, among a few scattered Prim-

roses, is one of the most striking of our mosses, growing in a tuft. It is the Long-leaved Thread-moss; and we are lucky to find it in fruit, for these are not at all common. The tufts are about three and a half inches high, and there are two kinds of stems: some lie more or less along the ground and bear no fruit, though they make up for this partly by rooting, and so making the tuft larger. Both kinds have long strap-shaped leaves, with toothed edges, standing out all around the stem and curving downwards. The erect stems have a bunch of leaves at the top, and from the centre of this rosette arise perhaps half a dozen hair-like stalks, each ending in a dark grey spore-capsule which droops gracefully. In most of our mosses, you will remember, these capsules occur singly: so that this cluster gives the present moss a distinct character you are not likely to forget.

LONG-LEAVED THREAD-MOSS.

A few yards farther along, the same bank has a fine

broad patch of blue, due to the free flowering of Germander Speedwell (Plate 17), which, though its flowers are small, is one of the most showy of our spring bloomers; but its flowers are of the kind that can be enjoyed only where they are growing, for when gathered they fall at once. It is a perennial herb, and quite early in spring its numerous branches spread around, covering a good space. At first lying along the ground, the newer parts rise, and from near their tips come long sprays of flower-buds. The oval leaves are in pairs with stalks so short that the lower edges meet: their edges are cut into large teeth. Only a few flowers on each spray are open at the same time, but the sprays are so many that the display of bright blue is quite striking.

It is worth while taking a close look at these flowers, for they differ in some points from those we have met with so far, and as there are many sorts of Speedwell in this country, it is well to know the family features, so to speak. To do so we had better sit at the foot of the bank, when we shall avoid plucking and losing them. We find that the calyx has four lobes which form two pairs; these hold the short tube of the corolla, which has a band of white around its mouth, from which it expands into four lobes or petals differing in size. The two side petals are alike, so they form a pair; whilst the back petal is broader and the front one is longer and narrower. This gives the

flower a distinct look ; and when you add the fact that there are only two outward-curving blue stamens which are nearly as long as the petals, you have as many points as you want for knowing a Speedwell when you meet with it. But we must take note, also, that the pistil consists of a two-lobed ovary and a slender purple style that is as long as the stamens and curves outwards over the lowest petal.

Now, when we come across a flower whose form is more or less distinct from the others we know, we may be pretty sure that its strangeness is connected somehow with the special insects that act as carriers of its pollen. Then we must sit still for a time, close to the plant, and see what happens when the sun is shining. A bee-like or wasp-like fly alights on the lowest petal with the pistil under its body. Feeling for support, its front pair of legs take hold each of a stamen, and the pull brings the anthers against its body, smearing it with pollen, whilst the fly's tongue is pushed down to the base of the ovary where a little nectar exudes for its reward. You see, the pollen that it has picked up on its underside from the anthers of this flower will, when it alights on another flower, be caught by the tip (stigma) of the pistil. The method is so certain in its action that the flower does not need to produce more than the two stamens : whilst many plants find they require a large number of stamens to each flower to effect the same end. The Speedwell

flower knows when the fly has done its work, for the two sides of the calyx at once press against the corolla and push it off: it is of no further use.

How different in habit is this Early Purple Orchis (Plate 17) standing up stiffly on its straight, tall stem to a height of a foot or more, the upper third bearing a number of red-purple flowers on all sides. Most of the long, narrow, spotted leaves come from the ground; the two or three on the stem are low down and wrapped round it. Until you have made a close study of them, the flowers of the Orchids are rather puzzling, because they differ in their make-up from all other flowers. They stand out facing you from the stem, and what you might think is a flower-stalk is really the long ovary, twisted so that the flower is upside-down. There are three sepals and three petals; and as the flower stands before us the sepals are at the back, standing over two small petals, whilst the third petal is a large, spreading platform in front, extending backwards as a curved hollow spur. Above the mouth of this spur stands the column, which is a union of the style with the stamens in one body. Only one of the three stamens is developed, and its two anthers will be seen, side by side, at the top, each in a slit-like pouch. The pollen-grains of each anther are attached to a stalk which ends below in a sticky disc, just above a ledge known as the beak; and under the beak there are two gummy patches which stand for the stigma

found at the tip of the style in most flowers. In some of the Orchids, the spur contains nectar; but the Early Purple has none, and the Humble-bee that is busy on one spike here will have to bite the wall of the spur in order to get a drink.

Now, see what has happened. The bee flies off with what appear to be four antennæ instead of the two with which she came. In pushing her head into the spur, she had to press against the beak, and this caused the discs of the pollen-masses to stick, so that, when she flew off the pollen-masses were pulled out of their pouches and looked like extra feelers. These begin to droop, so that a little later, when she visits another Orchis flower, their thick ends will be pushed against the stigma, where they will stick. Sometimes, they work so quickly that there are two or three pairs of these pollen-masses on the head that have not had time to droop enough to be caught by the stigma.

All along this sloping hollow, there are numbers of another Orchid growing among the bushes, but few people appear to notice it. Although it has a very tall slender spike of flowers, these being small and yellow-green do not attract notice; but they are not without interest, all the same. Although they have not got the hollow spur of the Purple Orchis, which would hold so much nectar, these flowers of the Tway-blade (as the plant is called) pour out the sweet fluid from the centre of the long, narrow lip, and at its

base there is a slight hollow filled with it. Little flies and other small insects are the chief seekers for it. The plant is so unlike any of our other Orchids that you may know it at a glance whenever you meet with it. Usually, it has only two large oval leaves, spreading out from the stem, several inches clear of the ground. There is another kind —the Lesser Tway-blade—which is found chiefly in the north; but it may be known not only by its much smaller size, but by its thin, small leaves being heart-shaped.

MAY-BLOSSOM.

With the last week in May, our wood will show us plainly that we have nearly done with spring. The fine old Thorns, which have here escaped the hook of the hedge-trimmer, and in the course of a hundred years or so have built up a rugged trunk holding up a great round head of tangled branches, are now so fully covered by the strongly scented May-blossom that they look like huge snowballs. Of course, so fragrant a perfume does what the tree intended it

should do—make known far and wide the fact that here nectar can be had freely—and we see the result in the great number and variety of the insects that have come to the feast. Most of the branches are too high for us to say what exact kinds of bees and flies and small beetles are engaged; but a few low boughs may be bent down so that we may box samples of the crawlers, active though they be. Among those that, by their brightness and numbers, attract us are two green Weevils: one, larger than the other, is the Shining-green Weevil, and its green may be silvery or golden; the smaller of the two is the Apple-green Weevil, whose tint is bluer and less shining. If you look at either through the lens, you will see that the strongly arched, tightly closed wing-covers are very finely grooved down their length and the ridges clothed with minute scales that cause the shine.

SHINING-GREEN WEEVIL.

1 Pl 22. **Common Lizard (p. 94)** F 84.

1 Pl. 23. **British Trap-door Spider** (p. 99) **Nest-tube of same** F 85.

V

SPRING ON HEATH AND MOORLAND

Heath and moorland have a character of their own which marks them as quite distinct in most things from woods and downs. The difference is due to the soil, which directly affects the plants that grow in it. The moor is covered by a thick deposit of peat; and the heath, though it may have a good deal of peat in hollows, is mainly sand. Owing to the absence of lime from either of these soils, they are acid ("sour") and many plants cannot endure acid food. But there are others that do not mind, and some that really prefer the sour soil so much that, if you plant them in ground that has a little lime in it, they sicken and die. By which we know that plants have taste.

In the first half of the year, most people would declare that the moorland is a desolate place. The statement would require some toning down before the naturalist could accept it; but it is true that it is in the second half that Nature makes use of the moor

for one of her finest large-scale colour effects—the flowering of Heather and Purple Heath. In the early months, the moor has to be looked at in detail, though there is one period when it presents a broad colour display that cannot be beaten—that is, when the Gorse is in full flower, which may fall at any time between February and April.

In the meantime, we can look about us and discover a few of the many things that are waiting for us. We can begin this look-out work as early in the New Year as we can find a day fine enough for the purpose. There is always a fair number of lichens and mosses of varied form; and in seeking these, perhaps among and under the clumps of Heather, we shall find insects, too, some active, others laid up for winter quiet. One of the most striking of the heath lichens at this season is the Reindeer-moss (Plate 21), abundant under most of the heath plants and well exposed under the larger bushes. It is quite as common all the year; but in the hot, dry months it is shrivelled to very small compass, and few people notice that it is a living thing. Now that there is moisture in the air and the earth, it has filled up every cell with water and done some growing also, so that it stands erectly with many branches and shorter branches and twigs from these. Its colour is a pale silver-grey, except that in some plants the short "twigs" at the tips of the upper branches may

support little brown knobs. These contain the minute spores by which the lichen increases in numbers. In Lapland, where it attains a much larger size than with us, it is said to form the chief food of the reindeer.

Already we have had a little talk about lichens in general, in connexion with the Dog-lichen ; and what was then said applies also to Reindeer-moss. The lichens all grow where they get plenty of light, which to the algal partner is essential ; but it means that in the hot, sunny days they become so dried that you may powder them between your fingers. The drying does not kill them, for on the return of moisture they plump up again and go on growing as though nothing had caused a halt in their progress. The Dog-lichen grew in large scales almost flat on the ground : the Reindeer-moss, though it has a few threads along the surface at first, soon changes the direction of growth and becomes erect and bushy.

All over the otherwise bare spaces on the ground, we shall find several related lichens to which our forefathers gave the name of Cup-moss—moss being their usual name for most small plants. With our present knowledge, it is clear that these lichens differ greatly from the true mosses, but it is better to retain the old name for every-day use. This Cup-moss (Plate 21) is only an inch or two high, and of a pale greenish-grey tint. It starts life as a tiny scale, then grows upwards as a tube whose mouth gets wider the taller it grows,

until it is trumpet-shaped or funnel-shaped. In this little patch before us some of the tubes are made quite showy by shining knobs of scarlet that look like red sealing-wax on short stalks : these are the spore-cases. There are many variations of form in the cups in the numerous kinds to be found in this country. You may find, instead of the blobs of " sealing-wax," that the mouth of the cup bears smaller cups growing up from its rim ; in others the " cup " is reduced to a long slender tube. Some of them grow in the woods, on decaying stumps, on fence-posts, and even on walls.

Here is a lichen of very distinct kind which has almost covered a smooth pebble with its small orange scales. Strictly speaking, it cannot be reckoned as one of the proper heath plants, for its old name is Yellow Wall-moss (Plate 21) ; and it is a lichen that you may meet with on any old wall, as well as on trees and, as here, on loose pebbles—in spite of the proverb which says " rolling stones gather no moss." It forms a close rounded patch which spreads in all directions at the same time, its margin cut into little lobes, which are the growing points. In the centre there are some shallow " saucers " in which the upper layer consists of spore-cases packed closely.

One great advantage about the collecting of lichens is, that if you do not wish to spend much time over them in the field, you just roll your specimens in thin

paper and drop them in your satchel or pocket, and find them in fine condition when you reach home.

There are plants here of a higher grade than the lichens, that show some independence of the seasons in the matter of growth and the ripening of their spores. So far as mere growth is concerned, there is always far more of it than meets the eye; and though the trees and bushes show little sign of it, the small things close to the earth—seedlings and mosses for example—have been busy already. Several of the larger Feather-mosses have made much growth with their long stems covered with bright, fresh, overlapping leaves, though it is yet too soon for their spore-capsules. But that is not true of all the mosses here, for here is a conspicuous tuft of the Juniper Hair-moss, so called because its stiff leaves have their edges curved inwards so that they are said to look like the needles of Juniper.

The plants are only about two and a half inches high, and two-thirds of this consists of a threadlike, leafless stalk supporting a shaggy, golden cap which covers the squarish-oval spore-capsule. Lifting one of the caps, which comes off freely, we find the large capsule beneath, with its very distinct lid ending in a stout beak. As the capsule swells out with the ripening of the spores, the cap will split up one side, and the wind will remove it. Next the lid will be pushed off, and we shall see that there is another lid inside attached to a central column. Here is one more advanced than

the others, for the lid has gone. Carefully cutting this down the centre we can see the neat plan adopted by the moss for dispersing its dust-like spores when these shall be ripe for sowing. Around the mouth of the urn there is a circle of teeth, now lying down upon the inner lid. When the spores are ripe, these teeth will stand up if the air is dry; and the same dryness will cause the central column to lengthen a little, pushing the inner lid nearly as high as the tips of the teeth between which little spaces will be left. When the wind blows or the moss gets shaken by the movements of bird, mouse or lizard, the dry spores will be jerked between the teeth. But if the air becomes damp, the column will contract and pull down the lid, upon which the teeth will now fold down, securing the spores that are left from injury by damp.

A little nearer to the summer we shall find a much larger member of the Hair-moss group on the damper parts of the moor—the Common Hair-moss, our largest moss, for it is commonly a foot or more high. It may be known at once by its size and its resemblance to the small Juniper Hair-moss; but it will be found that each plant looks more bushy because the flatter, longer leaves all spread out from the stem.

There are vivid patches, too, of Schreber's Feather-moss (Plate 21), densely clothed with shining leaves which taper to long points. The nodding oval capsules, which are far from being common, are not

at the end of the stem, as we found in the Hair-mosses, but on a long bristle from the side—which is a plan adopted by all the Feather-mosses. Many other mosses are clothing patches of the ground with their bright new growths, but as most of them will not bear fruit until later we will leave them for the present : so many of them cannot be made out with certainty until we can examine their capsules.

In the long hollow below there is a good deal of moisture, but not enough to make a surface stream. Patches of it are a bit boggy ; and a little later there will be Water Mint and Spotted Orchis there. A few Alders in a line show where the water runs underground ; and from this distance we can see that they have got the ends of their branches hung heavily with red catkins (Plate 18), much like the yellow ones of Hazel. The redness is due to the colour of the little round bracts that arch over the stamens. They make a fine show when the sun shines upon the trees. This is to be seen, usually in February, but in some years is delayed until March.

There are parts of the moor that are free from Heath and Heather, because the tall, spreading bushes of Furze shut out the light. But in March—in some years sooner—the Furze-bushes themselves become a blaze of golden light (Plate 20), for in the mass, at a short distance, the flowers appear to be of a golden yellow, but on nearer view they are seen to be much

paler. As the early spring sunshine falls upon the masses of flower-buds these partly open by lifting up the broad upper petal (standard); the other petals will not separate until a bee, attracted by the sweet odour that the flower gives off, comes and settles upon it, pressing down two other petals known as the wings, which forces the stamens to spring out of the two remaining petals (united to form the "keel") and dust the bee with pollen. As the result of the visits of the bees, we shall find, a little later, that the flowers have produced broad seed-pods; and in July these pods, turned black, have become ripe and their dry valves are curling up suddenly, with a sharp, crackling report and flinging the hard, smooth seeds far away.

FURZE FLOWERS.

Look over this Furze-bush, and tell me if you can see a single leaf. Sometimes, you may find a few; but they are very rare, for they have been turned into the smaller of the sharp spines that make the shrub so difficult to deal with. The large spines are small twigs, as you may know by the fact that they bear flowers. Why do I think the smaller ones are

A road among the Chalk-hills (p. 106)

1 Pl. 25.

G 93.

Greenfinch (p. 120)

Jackdaw (p. 123)

altered leaves? Look at these pretty little plants (Plate 20) growing on this clear space on the other side of the track. They have come from the sprouting of a few of the Furze-seeds; and if you look at them well you will learn something of how leaves may be changed into prickles. First of all, at the bottom of the stem, we have a pair of thick, oval leaves, which are really the two halves of the seed turned soft and green. They are filled with rich food upon which the seedling feeds whilst it is driving its root into the ground and building up a little stem. Close above the seed-lobes we have several pairs of leaves, each leaf divided into three leaflets, much like a Laburnum leaf. Then there are leaves that have got only the two side leaflets, whilst the midrib which should end in the third leaflet has become a sharp needle. Higher up the stem, in seedlings a little older which may have lost their seed-lobes, all the leaflets have become needles; and above the leafstalk of some of these leaves branches are shooting out from the stem, and these have the form of stouter, longer spines.

The Broom, which is a shrub related to Furze, has long green branches without any spines, but it has a sprinkling of small leaves very like those first trefoils of the Furze seedling. Now, it is thought that once upon a time the Furze was leafy and spineless like the Broom, but that in order to protect itself from being eaten by browsing beasts it changed its leaves into

sharp spines. The seeds are formed with a memory of the ancient form of its kind, and the seedlings start life in the ancient way. The seedlings of many other plants give us similar hints as to their family history and connexions, which are always worth looking into, though they may not always tell us the story so clearly as these Furze seedlings do.

BROOM FLOWERS.

On a sunny morning in March we may expect to see several active bright brown Lizards (Plate 22), newly emerged from winter quarters under the Heather or a dense Furze bush. They take instant alarm at any movement or approach, and are quickly under cover and out of sight; keep still for a few moments and they will return, and either bask on a bare, sunny patch of sand or climb the Heather stems in the search for flies or spiders, with which to make up for a long fast. They are covered closely on the upper side with small, smooth scales, larger on the head; on the under side, the neck and tail are clothed with small scales also, but between the two pairs of limbs the body is protected by six rows of much larger scales. They are splendid climbers, swarming up

the Heather-stems rapidly; and when they get to the top, shooting from one tip to another as quickly as the fly they intend to catch. It is not at all easy to grab one with the hand. In attempting to do so, you must try to get hold of the head and shoulders; if you get the tail it will snap off and be left in your hand, whilst the Lizard escapes and lives to grow a stumpy apology for the graceful original. If we come along here in the summer, we may be so lucky as to come across a batch of newly-born lizards, blackish creatures only about an inch long.

SAND LIZARD.

In a few English localities like this, and on some sandhills by the sea, there is found another kind—the Sand Lizard—a little larger, and with rows of white spots on the dark stripes of the upper side. The female Sand Lizard lays eggs instead of producing living young.

Among the taller growths of the moor are large numbers of small trees, examples of our numerous Willows. The one before us is known as the Goat

Sallow. Some Willows are known as such, some as Osiers, and others as Sallows; but they all belong to the Willow group. The Goat Sallow is related very closely to the Grey Sallow, but whilst the Goat likes drier places like this, the Grey prefers those that are rather wet. Both provide the so-called "palm," which consists of the flowers in catkins. The Goat has wrinkled oval leaves that are shorter and broader than those of the Grey. But those around us to-day are all Goats; though if you look at a group at a little distance, you might fancy there are two kinds—for some have got golden "palm" whilst on others it is silvern. When we were inspecting the "lamb's-tail" catkins of the Hazel, we found that the bud-like female flowers were at the tips of the branches on the same tree as that which held the swinging males. But in all the Sallows and Willows the sexes are on separate trees: the golden catkins are the males, the colour due to the yellow anthers, whilst the silver of the females is given by the long hairs of the bracts. Unlike most catkin-bearing trees, whose pollen is carried by the wind, "palm" provides a large amount of nectar. The bees know this, and they come from their winter retreats and swarm around the Sallow

SALLOW "PALM."

to enjoy it, their united buzzing sounding like the playing of an organ. The swarm of many kinds of insects you see and hear will continue until sunset; and in the evening their places will be taken by the larger moths that pass the winter in holes and corners.

And here, on this bank below the big Sallow, is another moss, one that we cannot ignore, for there is so large a patch of bright foliage and the stems end in long threads each bent under the weight of a large red capsule. It is one of the commonest of our mosses, but one whose beauty we are always pleased to welcome in the spring. It is known as the Swan-neck Thread-moss (Plate 21), and we may come upon it also on shady banks in the woods. The pale green leaves that are wrapped around the erect stem, have a thickened border which bears a row of sharp teeth. The capsule is closed by a half-round lid; and when this is pushed off, the spore-dispersal is seen to be regulated by a circlet of long teeth.

When April comes to the moor, we find that a good deal of life is about, besides that of the plants. Insects are getting numerous; and we may come upon a few nests of birds. Although from the number of Lapwings or Peewits we may see commonly flying and crying over the turnip-field and other cultivated land we may not expect to meet with it in wilder places; but the Lapwing is a moorland bird, and those we

see now belong to the place. That fine black and white bird with the long pointed crest, that is nearest to us, and performing aerial stunts, is the male. The female, no doubt, is sitting placidly on her four greenish-brown pear-shaped eggs at a distance, for the male is too knowing a bird to show concern when near the nest. We will not hunt for it just now: it is a greater pleasure to come on such things by chance, and feel that we have not alarmed the anxious mother by intention.

LAPWING OR PEEWIT.

There is a little matter close at hand which may be more of a novelty to you than a Peewit's nest; and without its being pointed out to you it might be passed unseen. Here, on this low bank crowned with Heath plants, is a rather shabby-looking length of cobweb. A nearer view shows that it is a tube, about a couple of inches long, so far as it is visible above ground, but it is clearly continued in the bank. We remove the sandy face carefully, and find the tube extends to a depth of about six inches; sometimes it is longer.

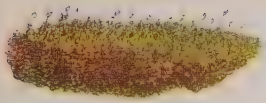
It does not strike you as a very exciting find; but wait a moment.

As you surmise, the closely-woven tube is the work of a spider; and the spinner is known as the British Trapdoor Spider (Plate 23). The name is by no means a good one; but it has become fixed by many years of usage, and we must put up with it. Some foreign spiders, you know, contrive clever doors that fit their nest-openings as neatly as a cork fits a bottle; but there is no stopper here. There is no fixed opening even; when the owner wishes to take in or throw out, she tears a gap for the purpose, then spins it up again. The long tubular web (Plate 23) is the entire work of the female spider; the smaller male appears to have no home, and is only an occasional visitor. She starts her nest when very young and enlarges it as she grows, digging out the underground portion and removing the sand with her jaws, then lining it with silk as an extension of the aerial tube. The outside of the upper part is coated with sand, to take away the cobweb look; for the tube *is* a trap although it has no door. The spider waits in this upper part, and by and by she knows that a fly has settled upon the outside for a moment's rest. In an instant she is there, and thrusting her sharp fangs through the wall and into the fly, she drags the victim inside and hangs it in her cellar until she feels disposed for a meal. First, however, the gap she has made has to be repaired.

Slight movement of the web shows that the spider is inside ; but we will not disturb her. At this season, it is probable that she has also about a hundred of her youngsters sharing house with her. In a few weeks or days, she will consider that they are large enough to take care of themselves, and will turn them all out of doors to construct tiny tubes for themselves, and to catch the smaller flies.

Here, where someone has been digging sand, the entrance to the shallow pit has been made bare by traffic. But what is the meaning of these neatly made holes in the surface? They are cleanly cut, quite round and half an inch across. Some insects that have been spending the winter underground, have now decided to take the spring air. And here appears to be one of the party, making off heavily towards the nearest Heather. He is a shiny black beetle, half-round and bulky, but not very large, for with all his toothed legs outspread he could stand on a half-penny ; but he is just the size, with his rounded back, to have bored one of those holes. Knowing his story, I can tell you with confidence that he did issue from one of them. He is known as the Lunar Dung-beetle, a near relation of the larger Dor-beetle that collides with your face in the lanes on summer evenings.

The Lunar Dung-beetle is distinct from the other members of his group, not merely in the matter of size, but because he has ornaments which they lack.



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1. Straight-stalked Earth Moss: natural size and enlarged (p. 113); 2. Creeping Feather Moss (p. 112); 3. Three-sided Feather Moss (p. 112).

1 Pl. 27. **Juniper and its fruit** (p. 109) G 101.

On his rather small forebody he has three sharp spines pointing forwards. Two of these, which are curved slightly, reach out to the front of his head on each side; the other, quite short, is half-way between the long ones. What purpose they serve beyond that of ornament is not known; but they certainly enable us to know him at sight. I say *him* with reason, because the female is without this adornment, though if you look very closely you may see little points where the long spines should be; but even these are not always there. Fabre, the French naturalist, has stated that the male's prongs are used for breaking up food and as a hod for hoisting up earth when escaping from the depths where the early stages of the Dung-beetles' life is spent; but if this were so they would be more likely to adorn the female, who is the chief labourer.

LUNAR DUNG-BEETLE.

The parent beetles bore deep shafts in the ground in spring, with a broad space at the bottom, to which they take down pellets of dung, and this is stored in a number of side cells, an egg being laid in each cell. Then the shaft is filled with earth. About a month later, the eggs hatch, and the little grubs begin to eat the food left for them, always enough to last until they are ready to turn into chrysalids. By early autumn

they have become beetles ; and after a rest they bore their way to the surface, find a meal and then dig in again to pass the winter underground. The holes you see around you are where they emerged.

Let me warn you that you must not make the mistake of thinking that all such holes are the work of beetles. At this time of the year many of those you will find are where some one or other of the interesting Mining-bees have made their exit from the deep burrows where they spent their early life. There are plenty of them sunk into the light, sandy soil of the heathlands ; and if you begin to pay serious attention to them you will be surprised at the large number of different kinds to be found in one district. Many of these, like some of our birds, come back to nest in the spot where they were born ; so that, when you know their favourite banks, you may in later years be sure of finding them at home.

These Mining-bees do not form big families like the Honey-bee and the Humble-bees, but each female works unaided to sink her shaft (from five to ten inches deep), perhaps with several cells at the end, each cell provided with a paste of mixed pollen and honey and an egg laid on it. One very large group of these miners is known as Andrena (see page 31), and you may see many of its members busy just now on the Sallow catkins gathering honey and pollen for this purpose. Some of them are not unlike Honey-

bees, but they are smaller as a rule; the likeness is helped by their having pollen-baskets on the hind-legs. When they have provided food and eggs for all the cells, they fill up the shafts with earth, to keep out certain other insects whose young would eat both food and eggs. You can see where these Andrenas are at work by the little heaps of earth they have thrown out of their mines; and if you watch for a moment you will see the busy miners themselves.

Just look up at the upper branches of this Birch. Do you see that little cloud of insects flying about them? Here is one, resting on the trunk where we can see it closely. It is the Orange Underwing moth (Plate 5), with red-brown forewings having a pale central blotch and the orange hindwings with a blackish patch on the inner side. The flying moths up above are males: the females, probably, are sitting quietly on the branches. They have all just emerged from the chrysalids. You see, the white-striped green caterpillar feeds upon the Birch; and soon the females will be laying their eggs upon the catkins, where the caterpillars will take their first meals, until the leaves are larger.

In April—in some years not till May—the yellow catkins will call our attention to another of the Willow family, the Dwarf or Creeping Willow, which is seldom more than a foot high, though its stem is several feet long. The greater part of its length lies

along the ground or partly under it; and as it is commonly among Heather, there is little sign of its presence until the pretty, upright catkins open. Until these are over there are no leaves, for you see that the silky leaf-buds are not expanding yet. When the leaves come, they will be lance-shaped, little more than an inch long. The Dwarf Willow is found on heathy ground all over the country, but it is among our little-known plants. It cannot claim to be the smallest of its tribe, for we have a Least Willow which keeps its branches as well as most of its stem underground, and only raises its twigs and leaves an inch or two above the surface. But that Least Willow is not here; it grows only on the mountains.

CATKINS OF DWARF-WILLOW

When May is reached in an average year, the moorland like other Nature strongholds is overflowing with things that force themselves upon our attention, unless we have the misfortune to be very dull persons. To those of us who are mostly alive to the broad

masses of colour Nature lays on some of her pictures, the moor is most attractive later on; but even now, with the Broom largely taking the place of the Furze in this respect, there is brightness on a large scale. Although the flowers of the Broom are larger and brighter than those of Furze, we never find the former in such dense, continuous masses as the latter: Broom bushes are more detached. The two plants are nearly related, but apart from the structure of their flowers and fruit they present very striking differences. We have seen how the Furze in its infancy has given up the production of leaves and turned them into green spines; but the Broom, whilst keeping all its stems and branches green and slender, has also retained the little trefoils of its seedling days. Now, this seems opposed to the view that the Furze has turned its twigs and leaves into spines to make them uneatable; but usually there is more than one way to reach the same end: the Broom has got there by making both leaves and juicy branches bitter and medicinal. Both cows and horses are said to refuse it as food; and if you break off a branch, you will not wonder, for it has a very repellent smell. The pods are larger and blacker than those of the Furze; the valves twist up to scatter the seeds.

VI

SPRING IN THE CHALK LANDS

ALTHOUGH many of our friends will picture the chalk-hills in the early days of the year as bleak, uncomfortable places where we meet with every wind that blows, with the probable addition of snow or sleet, we have memories of many pleasant rambles upon them in January, as well as in all the other months of the year (Plate 24). Besides the cold and wet—for which we may go prepared—every gleam of sunshine falls without hindrance on the Downs, and there are always huge umbrella Yews for shelter should things get very bad. But there are combes or valleys between the hills where most of the winds are shut out, and the bottoms and slopes offer us fresh mosses, ferns and other plants; whilst the hunter of insects and snails finds ample reward for his labours. Of many plants whose flowers we come to see here in summer we may now see the beginnings; others, we may find flowering here in February that will not be blooming elsewhere till March. These are things we should not

like to miss, so we start our Nature explorations early.

One of the things that strike us at once is a "left-over" from last autumn. This is the Old-man's Beard, though when we saw it last summer, covered with greenish-white flowers we called it Traveller's-Joy or Virgin's Bower. The flowers were formed of sepals which looked like petals; and when these dropped the cluster of carpels in the centre became tiny nuts, each with one seed in the shell, and its tip which had been the style grew into a white feather, an inch long or more. On the higher ground the strong winds have made the "beards" very thin and ragged, by pulling at the feathers and carrying the nuts far away. Here, they will wait until the wild March winds get at them.

It may seem strange to you to be told that this tall plant—it is about twenty feet high—belongs to the Buttercup family, but it is so, and it is the only British member that has got woody stems. For all that, it cannot stand upright without support: it has to lean against these Dogwood bushes and scramble across to the young Whitebeam behind. It has only a few of its leaves left, but these and the stalks of old ones will serve to show us how it rises in the world. The long leaf is broken up into five leaflets, and the leaf-stalk has so keen a sense of touch that it can tell when it is against something strong enough to sup-

port its own parent. It then coils its bare part right round the stronger stem and becomes as hard as wire. The wind may blow strongly enough to blow away all the old-man's beard and all the leaves, but it cannot break or pull away these wire-rings, which will hold the scrambling shrub for several years. We must see this plant again in the summer.

GREAT TIT.

No; there are no woodmen cutting here just now: what you took for the sound of a file sharpening a saw was an early call from the handsome bird sitting on the bare branch of that Juniper. It is the Great Tit, which you may know always by his sharp call and by his greenish back, black head and throat with white cheeks, and the yellow breast and underparts with a central black line coming down from the throat. He is a cheerful companion wherever there are trees and insects to be found. In some places they call him the Saw-sharpener because of the note that misled you. Sometimes, you may look around expecting to see a

1 Pl. 28. **Flowers of the Ash (p. 117)** H 108.

1 Pl. 28

Fly Orchis (p. 128)

H 109.

Chaffinch, for he has also a " pink-pink " note which sounds very much like the call of that bird.

At the beginning of February, along this Bottom, I have found the long Hazel catkins already shaking out clouds of yellow pollen and the small flower-buds of the Yew almost ready for opening; the Wood-spurge with the yellow new growths that would soon bear the strange flower-saucers; rolled-up leaves of Cuckoo-pint pushing through the earth; Dog's-mercury with its long strings of tiny green flowers hanging, and Sweet Violet and Hairy Violet with flower-buds on view.

Here is a thicket composed mainly of Elder, with a few of its relation the Wayfaring-tree, flanked by a Juniper or two. The Juniper, being an evergreen like the Yew, helps greatly in taking away any wintry aspect from these chalk valleys, and growing mostly as a bush acts as a protector to many more tender plants. The short, narrow leaves end in very sharp points, and are arranged in sets of threes around the young shoots. One of the bushes is now in fruit though it is not yet ripe (Plate 27). Most people speak of the fruit as Juniper-*berries!* but they are really cones; though the few closely overlapping scales which hold the seeds are fleshy and juicy. Like the cones of the Scots Pine, they do not ripen until the year after that in which they were formed. You may know when they are ripe by their blue-black

colour, covered with a fine "bloom." They have a very strong flavour of turpentine, but some birds appear to like this, for they swallow the ripe cones.

The Elder should have a little notice for it is the first tree to make any great show of greenness where it grows. This is due to the fact that its leaf-buds are only half closed by the few scales at the base, so that some of the leaves are quite free to expand as soon as the severest of the frosts have gone; here they have reached a fair size already.

It is curious to note that in this bottom, at no great distance from each other, we can note the same early leafing in three distinct plants. These, besides Elder, are Wayfaring-tree and Honeysuckle; and the three are all members of the same plant family. We shall meet with them again when they will call us to notice their flowers: till then we will remember that they were the first of the shrubs to show us their new leaves. In the case of the Wayfaring-tree we can have little wonder at the absence of protecting scales, for its wrinkled leaves are covered closely with branching hairs, and a pair of them side by side is pressed close to the branch or stem. At the top of each shoot is a thick, roundish bud, also very hairy, in whose middle is a mass of tiny flower-buds, which in May will have expanded into a bouquet four inches across.

Whilst we have these Wayfaring-trees before us,

it would be well to call your attention to this little scar on the stem. This is a sign which—when you know it and have trained your eyes to see it—tells you that a caterpillar has been feeding in that stem. It is now a chrysalis ; but before it threw off its last caterpillar-skin it bored a hole, to make a doorway through which it might emerge easily when it became a moth. But to keep out intruders that might destroy it the caterpillar spun this neat little door that looks so like the bark. The beautiful little moth which will walk out in June is known as the Orange-tailed Clearwing, and it looks much more like one of the smaller wasps than a moth. If we cut off the shoot that has the scar, and keep it for a few months, we may have the pleasure of seeing the bright little Clearwing emerge. That is a surer plan than coming out here to hunt the moth when it should be in flight.

Before we leave this thicket, there are some items of interest to be seen on the Elders. There was a little rain last night ; and it had the effect of plumping up what yesterday must have looked like bits of shrivelled leather, but have now spread out into wrinkled cups and some of them have taken the shape of your ear on a rather larger scale. This is a fungus known as the Jew's ear. In dry weather it dries up and becomes like a bit of thin horn. Now, it is soft to the touch, though tough and not broken easily.

The outside is downy like your ear, and the inside is thrown into smooth folds. This inner surface has a white "bloom" which consists of the minute spores by which the fungus is spread. These "ears" are really the fruits of the plant: the fungus itself consists of fine threads which run through the wood.

At this season the banks here are well clothed with mosses, and some of these from their size and brightness arrest our notice. Here is a great patch of the striking and sturdy Three-sided Feather moss (Plate 26) with crowded stems five or six inches high, bearing many short branches, the whole well covered with broad leaves that taper to long points and spread out all round the stems and branches. At the junction of branch and stem arise the hair-like stalks that support the broad oval capsules, which have a conical lid.

There are several other of the larger Feather-mosses here, but at present they are without the spore-capsules; so we will leave them till a later date. But on the sloping roots of this beech-stump there is one of the smaller kinds with capsules in plenty. Here is a patch that would sit on a sixpence, but I count no fewer than ten capsules on it. This is known as the Creeping Feather-moss (Plate 26). Its slender stems are rather matted, but with the aid of the glass you can see that they are covered with delicate spreading

leaves with fine points. The capsules, which are on long stalks no thicker than the finest hair, are long and round, very strongly curved, and greenish; some have a pale orange conical cap which is wider than the capsule, but where this has been pushed off there is a circlet of long yellow teeth.

DOGWOOD.

Among the mosses that are least likely to be noticed here, is one that might be said to be under our feet. To see it as it grows we must go down on hands and knees. It is called the Straight-stalked Earth-moss (Plate 26); but though it grows erect, its leafy stems are less than a quarter of an inch high, and the stalks of its round, golden-brown capsules are so short that they add little to the plant's total height.

We will leave these mosses just now, for we must make our way up the hillside and see how things are going on the high Down. It is a steep climb if we make a direct attack; it will be better to take a zigzag course, which will mean a longer route, but we shall have a greater variety of things to notice.

There are definite woods that climb the slope, with broad spaces of open turf between ; but if we imagine that the turf is mainly grass we shall be making a mistake, for a close inspection will show the early stages of a large number of plants that in summer will be covering the slopes with crowds of bright flowers of yellow, red and blue. These for the present we may leave alone, but we cannot ignore some of the shrubs and trees. There is plenty of Privet and Dogwood, and though the bushes are much alike in size, we can tell them at a distance because of the reddish colour of the thicker branches of Dogwood and the leathery leaves still clothing the Privet. This, though not nearly so evergreen as the Garden Privet (which comes from Japan), keeps much of its foliage through the winter if it is not in very exposed places. Already, its new shoots have started growth in pairs.

FIELD MAPLE LEAVES.

At the foot of the slope there are scattered trees of

the Common or Field Maple, which we may know mostly as an item in the hedgerow mixture ; but there it is seldom allowed to grow to its proper size, and its small trunk is usually hidden by Hawthorn and Wild Rose. Here it is growing freely apart, and showing that it can tower up straight to a height of forty feet, with a trunk that is two feet thick, covered by pale bark which breaks up into small knobs as the trunk is getting thicker. When it has reached its full size, these knobs are shed and the bark becomes smooth. The leaves, springing from the twigs always in pairs, will be unfolding in April, each cut into five lobes ; and soon after will appear the small clusters of yellow- green flowers, which few people notice.

WHITE BEAM LEAVES.

About the same time that the Maple puts out its leaves, another small tree begins to assert itself, until now almost hidden by the Yews around it. This is the White Beam, quite different both in leaf and flowers for it belongs to the same group of the Rose family

that includes the Apple and Pear. When its wrinkled leaves are well out there is no mistake in naming the tree from a distance up the hillside, even across a valley, for as the light breeze turns the leaves about they show the snow-white underside, and the tree seems to sparkle with silver. In May, every twig, of which there are thousands on the tree, bursts out into a loose cluster of many small white flowers. So many and so near together are these clusters that little can be seen of the foliage, and the tree becomes a pyramid of white blossom. Although the structure of the flowers will be found to be much like that of the Apple-flower, in size they are only about a third of those of the Crab. The fruit is a little apple, only half an inch across, and when ripe is scarlet in colour dotted with green. It has a core like an apple with similar "pips," but these are only half-sized.

Half-way up the slope there are clumps of a fine tree with which we are familiar from the fact that it is planted often in hedgerows, pastures and parks. But it is much nicer to meet with a tree where it has grown of its own accord, from the winged seeds that came from a distance in a gale and dropped among the scrub on this hillside. Some of the Ash-trees before us are of great height, with thick trunks; and this indicates that they have struck a patch of deeper soil than is general on the hillside: for the roots of the Ash go very deep as a rule. You can pick out the Ash

1 Pl. 30. White Helleborine (p. 129) H 116.

1 Pl. 31. **Hairy Violet (p. 119)** H 117.

easily even in winter, for the thick, black buds show up so plainly in contrast with the pale grey bark of the branches. As spring draws near these buds get very large; and then, in April, the side buds burst into tufts of fluffy flowers that are all stamens and pistils without sepals or petals. The biggest bud, at the tip of the branch, serves for a further growth of the shoot. You can examine the buds best on what the woodmen call a "ground-ash," that is, one of the long, straight wands that grow up from the stump of an Ash that has been cut down.

If we can reach some of the lower branches that are in flower, and look over them carefully, we shall see that the separate blossoms of a cluster are very simple affairs (Plate 28); we shall find, also, that they are not all quite alike. There are, in fact, three forms of flowers, which may be all on the same tree or on separate trees. It is worth while sorting these out, if we can find them all. One type consists of a pistil and two stamens with dark purple anthers; the second sort has two stamens and no pistil, whilst the third is like the first except that the stamens fall off almost at once without opening their anthers. As the pollen is carried by the wind, the flowering has to be got over before the huge leaves expand.

We are usually well into May before the leafing of the Ash has made any progress. When expanded

fully the leaf is so large that if it were entire like a Hazel leaf the upper foliage would put the lower branches into such deep shade that their leaves would not be able to work. So every leaf is divided into nine to fifteen large leaflets, arranged in pairs on each side of the long leaf-stalk, which allows the light to pass between. So large are these leaflets that many persons take them for complete leaves.

It is not far up the hillside before we come among the big Beech-trees, which seem to prefer the steep slope to the top of the Down, though there is a long, narrow wood of them near the edge. The foliage of the Beech throws a shade so deep that there are few plants that can exist many yards into the wood; and these have to get their work done in the early part of the year. The most abundant of these is Dog's-mercury, which we found in plenty also in the mixed wood, and then talked about them. There are two singular plants, however, that have found out how to live here—they are known as the Yellow Bird's-nest and the Bird's-nest Orchis, but the first is a summer plant, and there is nothing of either of them to be seen yet: we must remember them when we come later. In autumn, too, owing to the damp shade and a deep layer of decayed leaves, we shall find the beech-wood a fine place for a fungus-hunt. Just on its outskirts, where there is plenty of light, we shall find a few spring subjects, as well as many that are only

building up their leafy stems in readiness for summer flowering.

One of the most striking of these is the Hairy Violet (Plate 31), not on account of its size but of its numbers. In places the turf appears to consist of nothing but Violets. This is a kind that often gets mistaken for the Sweet Violet, but they are much alike until you consider them closely. The flowers are not scented strongly; mostly there is no fragrance at all. The long runners of the Sweet Violet are missing. This produces a more tufted habit. The leaves are longer, more triangular in shape, hairy on both sides; whilst those of Sweet Violet are of the proper "heart-shape," shiny, with only slight down. You will never find the Sweet Violet in dense crowds as the Hairy Violet is here, with thousands of flowers out before the leaves have got their full size.

Look at this fine plant of Hard-heads or Matfellon. It will not be flowering till well into the summer, but it is already quite attractive on account of its splendid rosette of leaves, each leaf a foot long, cut deeply into large segments which are almost distinct leaflets. They spread out in a broad circle, from whose centre the stout flowering stem is just beginning to rise.

There is a bird flying about that Juniper behind the Hard-heads, and seeming to be doubtful regarding our prying into things. The thick bill, the dull green

head and back, and the wing- and tail-feathers picked out with yellow, declare it to be a male Greenfinch (Plate 25), even without the help of the oft-repeated "twee." The reason for his doubts is plain, if you look into this Juniper-bush. There goes the hen-bird, less green in colour but with the same bright yellow lines on wings and tail. She appears to have just laid her third egg, and probably she will lay two more. The nest is just the usual basket of the finches, this one woven mainly of soft roots, with a neat lining of wool, feathers and hair. The pale eggs have a tinge of green and are spotted with red-brown. It is rather early to be finding the nest before we have got into April; so we may expect that this pair, after hatching these eggs and rearing the chicks, will have another brood later.

Let us take a look at the big Yew that stands apart from the others. Growing out in the open, it has been able to throw its great branches far out on all sides, covering a broad space. But huge as it seems, it is not as big as it looks: it is no giant among trees—even when we confine our attention to British examples. The Yew is seldom taller than this one, which is about fifty feet high; and that, when compared with Pine or Elm or Beech, is quite low. But its trunk, though short, is of great thickness. If I stretch out my arm straight on each side, the distance from my left finger-tips to those on the right is a little over

five feet; and that appears to be the thickness of the trunk. It would require three small men like me to reach around it with our finger-tips touching. There are Yew-trunks twice this size; but their measurements are often misleading. If we look at the stump left when a big Yew has been cut down, we shall notice that the outline is not regular as is that of a Beech-stump: it looks more like the map of an island, the coast-line broken up into a series of headlands and bays. This is due to the fact that after the Yew has ceased to grow in length, it sends up new shoots from the base of the trunk which become stout stems and unite with the original trunk. The thin red bark flakes off in long, narrow patches.

YEW: LEAVES AND FLOWERS.

Instead of having long needle-like leaves in pairs, arranged all round the branch as in the Scots Pine, those of Yew are not half the length, but are much wider, and are placed in a row along two sides of the shoot. The flowering of the Yew begins, often,

in February, but continues for some time by different trees. As a rule, one tree produces only the tiny yellow balls which consist of stamens, and another has smaller green knobs that look like leaf-buds and grow into the large red waxy cups that contain a single large seed. No: those big, spreading buds at the tips of some of the shoots with short, broad leaves are not flowers, but galls produced by a minute fly laying its eggs in the shoot.

There is one thing you will notice on these chalk-hills: that is the absence of Furze and Broom and Heather. You can find them in places, but only where the chalk is overlaid by beds of sand or gravel, as it is in some parts. The reason is, that these plants and some others have a very great objection to lime in any form, just as many of the plants we have met with here prefer soils containing lime. Come along to the edge of the Down, and look over the steep slope to the huge gap where men are busy—as they have been probably for hundreds of years—cutting out and carting away the chalk to the kilns to be burned. Chalk is a carbonate of lime, but by burning it is changed into oxide of lime, and is then useful for the making of builders' mortar and the wonderful cements and concretes that play so important a part in modern life.

Do you see that small flock of large birds, flying in and out of holes in the upper face of the quarry? No,

they are not Rooks, which prefer tall trees for their nesting-places. These are Jackdaws (Plate 25), as you may see when one flies nearer by its grey neck, white eye, and the bill much shorter than that of the Rook, which is a rather larger bird. When Rooks fly over here, they are often joined by the Jackdaws, but even when a mixed flock is flying or hunting together you can always tell which is which by the difference between the lazy "caw" and the sharply uttered "jack." In preference to the swaying topmost branches of the high elms, Jack selects a roomy hole of some sort where a load of sticks may be piled up as a foundation for the nest of softer moss and wool. These Jackdaws below us have not yet begun to accumulate their sticks, for they are all empty-billed; whilst the Rooks by this time have got nestlings.

When May arrives, the Downs, about the thickets and the margin of the tall beechwood, offer us many attractions. Along the ancient trackway there is a great show of the flat-topped white bouquets of Wayfaring-tree. We considered its leaves and stems and the moth-caterpillar that bores into them, some time ago. Now that the flowers are out, let us look at them for a few moments. We then referred to it as a relation of the Elder, which is not shown by the leaves, but if the two plants would only flower at the same time it would be easy to see a likeness in their

structure. If we pick out one of the many flowers from the cluster, we find that it has a five-toothed calyx and the short corolla-tube expands at its mouth into five lobes. Attached to the tube inside, there are five stamens whose anthers project outside ; and, of course, there is the ovary in the middle with a conical style. We shall find it equally showy in late summer when the flowers have been succeeded by bunches of flat red fruits.

This patch of stiff-stemmed plants with large oval leaves is the Ploughman's Spikenard in its second year. Being a biennial, it has not yet flowered, and will not spread its broad clusters of yellow blossoms until July : therefore, you will say, not of great interest to-day. But there is something of interest *on* the leaves : one of the smaller of the Tortoise-beetles, which are so-called because the upper shell of the fore-body and the wing-covers is brought close to the surface they are feeding on and the head and short legs are hidden under it, much as a tortoise hides its head and limbs in its shell. The kind before us is the Striped Tortoise-beetle, whose yellowish back is streaked with red and pitted deeply. There are several of them on each plant ; and their business appears to be egg-laying. A little later, we may find their curious larvæ with spine-fringed bodies and the forked tail turned up over their backs. A larger kind wholly green may be found on thistles, and a

similar but still larger on Water Mint and Hemp-nettle.

Just in front of the Ploughman's Spikenard, there is a big patch of yellow Composite flowers. The leaves though much like those of the common form of Dandelion, are quite small, the teeth into which their edges are cut are not uniform, and there are smaller teeth between the large ones. The flower-heads, too, are very small and where they have changed to "puffs" we can see that the fruits are bright red. Well, this is really our old friend the Common Dandelion, but so small in all its parts that you would scarcely pass it as such. It is a distinct variety that is only found in dry soils, sand as well as chalk; and we may know it as the Red-seeded Dandelion. In the usual form the fruit is brown.

The very showy black and red moth that is fluttering lazily by, as though it did not mind what bird chased it, is the Cinnabar (Plate 5). It is one of the first of its kind to have emerged from the chrysalis that has lain all winter among the decaying stuff near the root of its food-plant, the Ragwort. The plant is a sturdy weed that is found in vast numbers wherever there is waste land, without regard for the nature of the soil; but it certainly has a fondness for the chalkhills and slopes, and soon great spaces here will be covered by it. At present, there are only short new shoots

from last year's fleshy rootstocks; but in the course of a few days there will be hundreds of the Cinnabar-moths seeking them out and laying their eggs upon them. There is a female just now inspecting that tuft of Ragwort, heedless of our nearness to her. It is one of the moths that are easy to capture; and though in most years so very abundant it is scarcely known to ordinary folk—though always admired when shown to them.

In the majority of moths the forewings are so coloured that when the insect is at rest and they are closed over the brighter hindwings, the moth is not very distinct from its resting place. In the Cinnabar both fore and hind wings are conspicuously coloured, and they are seldom folded when at rest. The dingy black upper wings have a clubbed line of red along the front edge and two spots of the same colour on the margin, whilst with the exception of a thin black border the hindwings are wholly red. Such strong contrasts in colour are a warning to all the creatures that feed upon insects that this one is not good to eat. For the same reason, the caterpillar is marked with alternate rings of black and orange. When the Ragwort plants are two or three feet high, the caterpillars that come from the eggs now being laid will be swarming on their stems, feeding on the leaves, and will be plain for everybody to see; but the insect-eating birds and lizards know better than to touch them.

We shall meet with other examples of this kind of colouring when we get more into the caterpillar season.

In the broad shade cast by the high Beeches, where there is a good depth of moist leaf-mould, there is a long sweep of the prim little Woodruff, just come into flower. It has a long, slender rootstock that runs through the leafmould and sends up a number of jointed square stems, about a foot high, very erect and growing just far enough apart to allow the "ruffs" to spread freely. These are made up of seven or eight neat little shining leaves, all on the same level and growing out stiffly from the stem in a circle. Above the topmost ruff the stem branches out to support a loose cluster of tiny, pure white flowers. Our great grandmothers were keen to collect little bundles of Woodruff, to lay it between their clean linen, because in dying it gives off a pleasant odour like that which wafts from the newly cut hayfield.

WOODRUFF.

All the members of the Bedstraw family—to which Woodruff belongs—have their leaves arranged in a similar fashion, but most of them being long trailers they lack the neatness of the one we have been

admiring. Not far off, however, is a relation known as the Crosswort, the only other that flowers so early.

CROSSWORT.

A good deal taller than Woodruff, it is not so erect, the lower part of the hairy stems being curved before they grow up. Then, too, its hairy leaves are much broader, and there are only four of them on each level, placed crosswise, whence the name. The more numerous flowers are only half the size of those of Woodruff, yellow, in a ring of small clusters just above each leaf-cross. You may come across the plant in other places, but we have found it more frequently on chalk or limestone.

A more distinctly chalk plant is this little Fly Orchis (Plate 29), almost hidden away in this thicket. Several sharp-eyed people I know have searched for it here without finding it, although there is a small company of the slender stems, and all with flowers. But the Fly has fewer blossoms than most of the orchids, and of these few only two or three are open at the time, though this helps to make them look like flies more than would be the case if there were a crowded spike

of them. The flower of the Fly is really a much closer portrait of an insect than either of the other orchids whose names prepare you to look for a likeness.

Let us be content with a good view of the flowers as they grow, instead of picking them; for the Fly might not be so rare a plant if people would allow the flowers to become seed-capsules and scatter the ripe seeds. Well, a close view of the flower shows that the body and wings of the fly are furnished by the lip of the flower, which is purplish-red at its two ends and bluish in the middle. The two other petals, which are very narrow, form the fly's feelers, and the insect appears to be clinging to the three greenish sepals.

It is yet too soon for the Bee Orchis, which will soon be in numbers among the grass in the open; but in the wood under the Beeches there are many flowering spikes of another of the orchids. This is the White Helleborine (Plate 30), which differs from most of the others in having two or more stems from the same roots; its leaves too are broader than most. Its creamy-white flowers are rather large, and distant one from another. The sepals and petals, which are much alike, stand erect; but the lip, which you may know by its yellow tip, is turned out a little between them when the flower opens.

Farther in the beechwood, where the canopy of

new leaves is already dense enough to shut out strong light, one of the strange plants referred to earlier is towards the end of May breaking through the rich leaf-soil. This is another of the orchids, though at first sight its dingy colour would not lead you to expect it was a member of that bright race. This is the Bird's-nest Orchis, so-called because the mass of fleshy fibres of its roots was thought to have some resemblance to a nest; but it is not easy to see it. In looking for such likenesses people sometimes missed the really wonderful point, which is that this big Orchis, with a spike of perhaps fifty large flowers, can get on without a leaf or any other green part. There is very little variety of tinting between the stout stem, the flowers and the large scales which may represent former leaves: all is yellow-brown.

Now, without the leaf-green (chlorophyll) which colours the stems and leaves of nearly all the other flowering-plants, ferns and mosses, a plant cannot make its own food out of the salts it gets from the earth through its roots and the gases it takes from the air into its leaves. At one time it was thought that the Bird's-nest Orchis was a parasite, like the Broom-rapes, getting its food by tapping the roots of green plants; but if you were to dig up this Orchis you would find that it is not so connected. Instead, you would see a web of fungus woven about the fleshy

fibres. The fungus is a friend which can extract food from the decaying leaves, and some of this is passed on to the Orchis and stored in the "bird's-nest." Even the orchids that have green leaves depend to a great extent upon the aid of fungi known as

BEECH-LEAVES AND FLOWERS: A. FEMALE FLOWERS; B. MALE FLOWERS.

Mycorrhiza; so it is not so wonderful that a few of them have learned to rely upon the fungus entirely.

Far above our heads, all view of the blue sky is now shut off by the fully expanded leaves of the Beeches, but they are still so tender that a good deal of light passes through them, tinted a delicate green which is

very pleasant to the eyes. Moving outside to the edge of the wood, there are much lower branches whose leaves can be examined closely. Their texture seems very different from that of the stiff, red-brown leaves of last year that still lie thickly under foot. They had done their work, and their cells were filled with substances of no use to the tree, before they were thrown off. The tender new leaves admit the light rays freely; and no doubt there is great activity in their cells in making what will build up new twigs and shoots, and thicken the branches and trunk. Just now, you will notice, every leaf has a fringe of the most delicate silken hairs, which with others on the ribs beneath, helped to protect the baby leaf when it was folded up in the bud. A little later you will find there is no fringe: having served its purpose, it has dropped off.

But there are other things on this branch besides leaves: the clusters of flowers are too large to be missed. These, you will see, are of two kinds, one sort with much longer stalks than the other. The long, drooping, hairy stalks end in a knob of many small flowers which, looked at through the lens, are seen to be little bells with toothed edges, containing a number of stamens so long that their anthers project far out of the bell. The other kind, on the shorter stalks are a bristly oval shell, with four lobes at its mouth; and this contains only two flowers; and

these have no stamens, but just an ovary with a three-branched style. When the flower clusters with the stamens have shed their pollen, they drop off: there is no further use for them. But the flowers with pistils, when they have received pollen blown to them by the wind, each develops into a three-sided nut with sharp edges which, when they are ripe next autumn and slipping out of the hard prickly, outer shell, we shall call Beech-mast.

FIELD MOUSE-EAR CHICKWEED.

On the slope outside, there is great activity among a crowded assemblage of plants—Mulleins, Viper's-bugloss, Hound's-tongue, Musk-thistle, Deadly Nightshade, and others—which are building up tall stems in readiness for flowering a little later. But among the smaller things, among the grass in the clearer parts, there is one already in flower which we must look at before we go. This is the Field Mouse-ear Chickweed, closely related to the small-flowered Common Mouse-ear Chickweed we find in dry fields everywhere. This one has flowers as large as those of the Stitchwort of hedgerows and copses, for which at a distance you might mistake it. The Field Mouse-ear is a less common plant, found only on sandy and

chalky soils. It produces a number of long hairy branches from the rootstock, and these at first lie along the ground in all directions, with crowded pairs of narrow leaves, then raise themselves up and branch into clusters of pure white flowers, nearly an inch across, which make a fine and pleasing show.

On some of the tall, dead grass-stems of last year, still standing stiff and unbroken, there are some rather pretty snails, that have retired to rest there instead of hiding about the roots, as so many of them do

HEATH-SNAIL

during the day-time. This is the Heath-snail, which might as well be called Down-snail, for it is more abundant on chalk than on sand. In the usual form of this snail, the small inner coils are raised only slightly above the large outer one; and you can pick up a few that are quite flat. On the other hand there is a well-marked variety which is quite high in the centre. The very pale buff colour sets off a band of brown that runs round near the top of the whorls; and if you turn the shell over, you will see there are

several thinner, fainter lines around the deep central hollow. The yellow-grey animal that makes and lives in the shell is of a retiring habit, and when resting in his shell closes the doorway with a thin film. This is as well, for he appears to be in request by certain beetles who would make a meal of him.

There are many other kinds of snails to be found around here, now awakened from a long winter sleep ; but few of them are seen so easily as those that frequent the hedge-row and wall-foot. One that is quite plentiful here is seldom seen, because of its shape and habits : this is the Lapidary-snail, so called because the old naturalists thought that it cut its way into stone and wood. The lower side is rather flat, so that when it is sitting at rest on a trunk, it looks much like one of the low knobs of the bark. It is certainly taken as such on the bark of the Beech, where you are now looking at it. The shell is coloured a dark red-brown, and it has a sharp keel forming its outline ; the mouth oval.

LAPIDARY-SNAIL

Very different in form and substance are these Plaited Door-snails among the moss in the forking of these Beech-roots. Only two-thirds of an inch long, they are spindle-shaped, of thin texture, and

glossy brown. It is quite easy, when you are hunting for this snail at this season, for you to be "taken in" for a moment by picking up the empty leaf-bud scales thrown down by the Beech: for the snails are much like them in form and colour. This snail I am holding has withdrawn into his shell, so that you can see a couple of shelly ridges on the inner wall of the pear-shaped mouth. Now that he has gone far enough in, a little plate springs across the opening and acts as a door. It is useless for any of the slender bodied beetles to attempt to push its head in and try to eat the snail: the door is a spring-door, and can be opened only by pressure from within.

PLAITED DOOR-SNAIL

On some of the old leaves of Bramble which have weathered the frost and gales of winter, you will find a pretty little insect which in the past was somewhat of a puzzle for naturalists. Here it is, one of the Powder-wings or Snowy-flies—of which one species is a great pest to the growers of Tomatoes under glass. This one on the Bramble looks like a tiny moth of the purest white, save for a dark patch near the rounded end of the wings. Head, legs and antennæ are of the same colour. As it sits with its four wings closed like a resting moth, it measures only about a tenth of an inch. The great Linnæus was so imposed upon by its moth-like look, that he

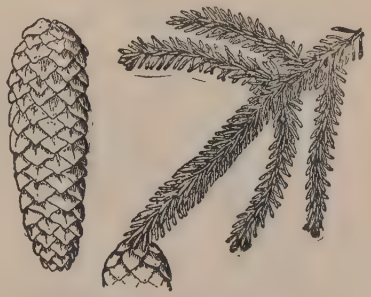
classed it as a moth; but a little later when its life-history was studied, it was found that in its early stages it was more like the Aphis or Plant-louse; to-day it is known to be related to what are called Scale-insects. If you examine one of these Snowy-flies with a good lens, you will find that the wings are not covered with scales, as in all the moths and butterflies, but the soft downy look is due to a coating of powdered wax. Much of this powder has been shaken off upon the leaf, where this female has laid a batch of yellow eggs, which are fixed to the leaf by little stalks. When the eggs have hatched, the soft grubs scatter a little over the leaf, then fix their beaks into it and remain there, sucking, until they have got their wings. Here, on the leaves of this Celandine, there is another species without any spots on the wings; and you will find another rather like it on the May-tree. Such things are much too small for most people to think worth bothering about, until some of them happen to swarm in their gardens and disfigure their choice plants: then they expect somebody else to tell them how to deal with the "pest." One, for example, abounds on the Cabbage.

Christmas-trees! Oh, yes; those are Christmas-trees, properly speaking Spruce-firs; but they do not belong here as the Yews and Beeches do. Like the Scots Pine, and the Larches down in the Bottom, they have been planted in order to get a variety in

the timber. They belong naturally to Central and Northern Europe, but they grow quite well when planted here. These are probably nearly a hundred feet high, with great lower branches almost sweeping the ground, and the regularly disposed upper ones taking an upward and outward direction. You know the tree quite well from studying the small ones at home at Christmas time; but these give you a better idea of their grandeur and importance. You may have noticed that the leaves are not flat like those of the Yew, neither do they rank in two rows with the twig between: here, although they end in sharp points (for which reason they are often called "needles") they are actually four-sided and attached in spirals, so that the twigs are covered completely by them. They are evergreen, of course, and keep their freshness on the tree for six or seven years at least, sometimes for ten years. We sometimes hear complaints that the Christmas-tree soon becomes a nuisance in the home through the leaves dropping off and littering the carpets; but that is because the necessary watering of the roots has been forgotten—the poor tree has died of thirst and the warmth of the room has dried it up.

Another point we can notice in these trees is the difference in the shape and size of the cones as compared with those of the Scots Pine. Those, you will remember, are really conical, tapering from a thick

base to a narrow tip, with the thick scales pressed tightly one over the other until the seeds are ripe in their second year. There are many cones of the Spruce hanging downwards from the upper branches and nearly ripe, but out of our reach. On the ground there are plenty of older ones that have fallen, from which we can get a close view of their size and shape. You will see that these are more regularly round, tapering only slightly towards the blunt point, and that they are four or five inches long. Further, the scales, though woody, are thin and do not overlap so closely—in the fallen cones they are well apart, as they opened to set the seeds free.



SPRUCE-FIR LEAVES AND CONE

On the upper branches, the new flowers are breaking out, from which will come the new crop of cones: their tufts of red and yellow giving a very pretty effect against the dark green of the foliage. One other matter should be pointed out whilst we are here, for many people misunderstand it.

Some of the shoots on these lower branches end in what looks like a small Pine-cone, and some folks

regard it as such, but they are much in error for it is really a gall caused by an insect related closely to the Aphis, and often spoken of as the Spruce-aphis. Some new galls are being formed, in all probability, whilst we are talking about them. Omitting some of the details, this is the story. As the buds for the new Spruce shoots are throwing off their scales, a wingless female of the insect, which has sheltered among the leaves all the winter, is now busy laying her eggs on the shoot. As soon as they hatch, the minute Aphides will fix their beaks in the tender tissues and begin to suck the sap. This sets up irritation in the tree, with the result that the base of the attacked leaf that is forming becomes enlarged, and as several leaves so affected are close together, a thick one-sided gall is formed enclosing each Aphis in a cell. Later, the scale-like leaves of the gall lift themselves up and disclose the cells from which the insects emerge. These cast their skins and reappear as females with

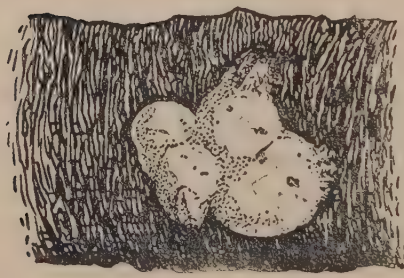
GALL OF SPRUCE-APHIS

wings. Some of these remain on the Spruce and lay eggs which produce females without wings, whose task it is to spend the winter among the leaves and in spring lay the eggs of another batch of gall-makers. The other winged females that escaped from the gall take flight and settle on the nearest Larch-trees, where several generations are born, and the next year some of the newest of these will find their way back to the Spruces and give rise to gall-makers again. It is a strange story; and in some respects it is like that of the unrelated Gall-wasps that have emerged from Oak-apples laying their eggs on the roots of the tree, where another kind of gall is formed.

We have a great number of insects more or less closely related to the Aphis, but all sharing its habit of spending the whole of its life in sucking the juices of the plants each kind favours. But some of them differ very much in appearance from ordinary Plant-lice. Here, on this stem of Dogwood, for example, is a case in point. These little blobs of white, pear-shaped in outline, look as though some one had been spilling melted fat over the bush. If you had to guess how they got there, you might be inclined to say that a tramp had been passing the night here and had fixed a lighted candle which had guttered and dripped over the stems. The truth is that, under the narrow end of each of those blobs, there is a tiny Aphis-like insect fixed to the stem by its sucking-tube. It attached itself

at the beginning of its life, and it will not change its position. Like other insects, it casts its skin at the several stages of growth, but these remain and are covered by wax which exudes from the insect's body. With tender care you can prise off one of the larger blobs, and with your lens you will find the insect at the end.

Owing to this habit of forming a skirt of wax, these insects are known under the general name of Scale-insects. This kind we may call the Sallow-scale, because it is found more commonly upon Sallow, Willows and Ash, less frequently upon other trees and bushes. It is only one out of about sixty native Scale-insects; but in our greenhouses as many more of foreign origin may be found, these having come attached to the plants we have imported from abroad. They can exist under the protection of glass, but perish in winter if they venture outside. That is just as well, for we have as many native species as we want, and some of these are very troublesome, though not so



SCALE-INSECTS

easily seen as this Sallow-scale. One, of a dark brown tint is a great nuisance to fruit-growers, who know it as Mussel-scale from its shape. It may be in crowded thousands on the bark of an Apple or Plum tree, and yet may not be noticed. Much of the damage that results from the attack of Scale-insects is due to their voiding of the so-called Honeydew, a sweet sticky fluid that attracts Ants and other insects and forms a suitable ground for the growth of moulds which clog the pores of the bark.

There is an old saying that, if you talk of the devil you will see his horns! This dead Beech, with its bark loose and falling off, was killed by one of these Scale-insects, known to timber-growers as the Beech Coccus and Felted Beech-scale. On the bark that is left, there are large whitish patches which, looked at closely, are seen to consist of minute bags of loose waxy threads. Attacked trees may be covered so thickly that at a little distance they look as though they had been coated by drifting snow.

In looking at one thing that has called for notice, you sometimes happen upon something that is quite different in its nature. Here is a case in point. Lifting off a piece of the slightly loosened Beech-bark, there is revealed on the under side a group of strange creatures that wriggle as the light falls on them. They are yellowish in colour, with big shiny heads and spiny bodies that taper away to what look like very long,

bristly tails. They are a species of Midge in the chrysalis stage, and what appear to be tails are really the empty skins that covered them in the grub-stage. We will take away this bit of bark, keeping it in this glass-topped tin, where it will not dry up, and in the course of a few days the Two-spotted Midges will emerge, but will be unable to molest us as Midges do. You have had experience of what Midges can do in the way of tormenting us, leaving the grass and herbage in the evening and settling in the short hair around our necks; sucking our blood and setting up an intolerable irritation?

CHRYSALIDS OF MIDGES

The Midges are very small two-winged flies; and here is an illustration of what much smaller insects of the same order can do. This distorted swelling of the shoots of the Goat Sallow has been caused by a minute Midge allied to the Hessian-fly that injures young plants of Wheat. The present one pierces the new shoots of Sallow and Willow, leaving her eggs within. This annoys the plant, and it forms this shapeless gall, in which the Midge-grubs feed. This one is

about three inches long and an inch thick at the rounded base; whilst there is a smaller one a little below it, caused at the same time but, probably, containing only one or two eggs. We are too late to get the insects, for these delicate films sticking out from the gall are the empty skins of the chrysalids, and there are many pin-holes showing where the others emerged.

ST. MARK'S-FLY

Here are many other of the two-winged flies, but mostly so active that it is difficult in most cases to make out their identity whilst they are so active on the wing. But one of a larger sort has settled on the bright yellow flower-head of the pretty Mouse-ear Hawk-weed, making a feast of the pollen. A small company of the same kind flew by a little while ago, noticeable on account of their being uniformly black and polished highly. It is one of the few flies that have got a folk-name, for this has long been known as St. Mark's-fly: the reason being that it makes its appearance in numbers about the fourth week in April, and the 25th of the month is St. Mark's day. This is a female, as we may know by its small eyes well apart, whereas those of the male are so large that they come together, and make the head much

wider than it is in the female. In the grub stage, it feeds on the roots of grasses.

Beyond the little patch of Hawkweed, there is a broad sheet of richer yellow—a cloth of gold—that extends far up the slope. That, as you can see from here, is a great company of Cowslips, a flower that everybody knows; if our eyes were closed, we should know they were near by the pleasing fragrance brought from them by the gentle breeze. Though the Cowslip and the Primrose are related to each other very closely, there is no danger of mistaking one for the other. For one thing they grow in different soils, the Primrose liking the leaf-mould in and about woods, whilst the Cowslip prefers the stiffer soils of the fields and chalk-hills. As was pointed out when we met with the Primrose in the woods, the great number of long-stalked flowers on a plant all spring from a short stem that, usually, is hidden among the leaves. In the Cowslip the stem has grown to a height of perhaps six inches, and bears all its flowers on much shorter stalks in an

COWSLIP

umbel from the summit. Then, although the flowers of the two plants are formed on the same plan, they are made by a slight variation of the parts to look totally distinct to the eye. There is, first, the difference of tint—the yellow of the Primrose paled almost to white, with just five little specks of full yellow around the mouth of the tube ; contrasting with the deep yellow of the Cowslip, whose central spots have become orange. Then, whilst the lobes of the Primrose corolla are broad and flat, those of the Cowslip are smaller and turned up to form a cup.

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